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Collective Review

THE PARATHYROID GLANDS, WITH SPECIAL EMPHASIS ON SURGICAL ASPECTS

DONALD E. JANELLI, M.D., Williston Park, New York

Historical Background
Classification of Parathyroid Disease
Pathological Physiology of Primary Hyperparathyroidism
Anatomy and Embryology of the Parathyroid Glands
The Clinical Picture of Primary Hyperparathyroidism
Parathyroid Adenoma
Carcinoma of the Parathyroids
Primary Parathyroid Hyperplasia
Parathyroid Cysts
Secondary Hyperparathyroidism
Diagnosis of Primary Hyperparathyroidism
Parathyroid Surgery
Other Considerations of the Parathyroid Glands
Summary

HISTORICAL BACKGROUND

THE PARATHYROID GLANDS were discovered and named by Ivar Sandström of Upsala, Sweden, in 1880. An excerpt from his original paper[1] indicates that he apparently recognized them as separate entities: "So much the greater was my astonishment therefore when, in the first individual examined, I found on both sides at the inferior border of the thyroid gland an organ of the size of a small pea, which, judging from its exterior, did not appear to be a lymph gland, or an accessory thyroid gland, and upon histological examination showed a rather peculiar structure." Unfortunately, the discovery of these important structures was unappreciated and Remak rediscovered and described the parathyroid glands in 1885 (35).

Following the anatomical identification of these structures, further investigation of the glands was based on two basic approaches, one physiological and the other pathological.

In 1891 Gley, a French physiologist, demonstrated the functional integrity of the parathyroids to be distinct from the thyroid by producing tetany in extirpation experiments (1).

In 1900 Loebs demonstrated that blood calcium was concerned with muscle contraction. In 1909 MacCullum and Voegtlin found serum calcium low in hypoparathyroidism and, at the same time, a method for treating tetany (35).

Biedl, in 1916, produced excellent experimental evidence to indicate that the parathyroids have an internal secretion, by transplanting the parathyroids of a dog into the spleen of the same animal and subsequently removing the thyroid. No tetany appeared until some months later when, following removal of the spleen, fatal tet-

[1]From a translation by Carl M. Siepel which was edited by Charlotte H. Peters and John J. Fulton and which contains biographical notes by Prof. J. August Hammar. From the Johns Hopkins Press, Baltimore, 1938.

any appeared in 24 hours. Removal of the thyroid in this experiment was an important step at this time as tetany had been observed clinically following thyroidectomy. Since the parathyroid glands were of unknown function, it was necessary to rule out the thyroid gland in relation to tetany (18).

In 1923 Hanson prepared an active parathyroid extract from fresh bovine glands by soaking the finely macerated tissue in pure distilled water at 40 degrees C (28). Collip independently produced an active extract in 1925, which he found would prevent the appearance of parathyroid tetany in experimental animals by restoring serum calcium levels to normal limits (18).

Collip also noted in other experimental work in the same year that, if the parathyroid extract was given to normal dogs, it resulted in hypercalcemia and, if the administration of the extract continued, death resulted. In death of the animal from overdosage, a terminal rise to higher than normal levels of serum phosphorus was noted (19). This hypercalcemic effect is observed to be similar in dogs and man. The effect is less noticeable in herbivorous laboratory animals such as rats, mice, rabbits, and guinea pigs (8).

In addition to this physiologic approach to an understanding of the parathyroid glands, there was a pathologic approach which had its beginning in 1891 when von Recklinghausen first described osteitis fibrosa cystica. The autopsy protocol in this historic case noted, in addition to the chief skeletal pathologic characteristics of fibrosis, cysts and brown or giant cell tumors; there was a red-brown soft tissue tumor above the left thyroid lobe which was considered to be a lymph node. In retrospect this probably represented a parathyroid adenoma, but its significance in relationship to the skeletal disease was not recognized at that time. It was not until 1903, when Askanazy described a case of osteitis fibrosa cystica and commented upon the parathyroid tumor which was present, that an association between the two lesions was considered (1).

In 1906 Erdheim, a Viennese pathologist, had his attention directed to the relationship between the calcium metabolism and the parathyroid glands when he noted crumbling of the teeth of parathyroidectomized rats. He subsequently examined the parathyroid glands in all cases of bone disease coming to autopsy, and in 1907 described parathyroid hyperplasia in osteomalacia. He concluded that the hyperplasia was secondary to the bone disease and therefore beneficial.

Schlagenhaufer, in 1915, pointed out that the parathyroid enlargement seen in association with osteitis fibrosa cystica involved only one gland and therefore could not be secondary to the bone disease, in contrast to osteomalacia and its associated diffuse parathyroid hyperplasia and hypertrophy (1).

Subsequent events proved Schlagenhaufer's concept to be correct. Mandl, a contemporary Viennese surgeon, had under his care at this time a patient with classical osteitis fibrosa cystica of advanced degree. In accordance with the notion that the parathyroids were beneficially involved as the result of the bone disease, the patient had received extracts of animal parathyroid tissue without benefit and had also been the recipient of transplanted parathyroid glands. These had been removed, as soon as death occurred, from a patient brought to the clinic in a dying condition (1). This attempt at relief by transplant was probably based on work done by Eiselberg in 1907, who reported the first successful heterotransplant of parathyroid tissue (35). Again, however, there was no improvement in the patient's condition.

In 1925 the patient's condition had become so desperate that Mandl followed Schlagenhaufer's suggestion and removed a parathyroid adenoma which was found on cervical exploration. The patient, for the first time, showed clinical improvement and subsequent x-ray studies showed recalcification of the bones (1). This operation marked an important milestone in parathyroid surgery as it proved the correct relationship between parathyroid adenoma and osteitis fibrosa cystica.

For the sake of historical accuracy, it should be noted that a parathyroid adenoma had been surgically removed a year earlier, in 1924, by Charles Richardson of Macon, Georgia. This case was unreported until recently when he sent a personal communication to Rienhoff (70). This earliest case lacks historical significance for this reason as well as for the reason that there was no correlation of the pathology to the clinical picture. The patient was a 25 year old female with a history of repeated fractures and a palpable cervical tumor which on removal was found to be a parathyroid adenoma. Following

surgery, the patient had no further fractures and eventually died of renal failure and hypertension.

For a number of years following Mandl's dramatic case, attention was directed solely toward the skeletal system for clinical manifestation of primary hyperparathyroidism. It was not until the last decade that Cope and others directed attention to the urogenital system as another source of evidence of hyperparathyroidism (21). In 67 patients with primary hyperparathyroidism, proved by operation, Cope found that the urogenital system was involved secondarily by stone formation more often than the skeletal system was involved by either osteitis fibrosa cystica or diffuse osteoporosis. Twenty-eight per cent of his patients showed classical osteitis fibrosa cystica, 17 per cent diffuse osteoporosis, and 55 per cent showed no evidence of bone disease but presented kidney stones. Between 10 and 15 per cent of all the patients with renal calculi seen by Albright and Cope were found to have hyperparathyroidism (21). It has been estimated that from 0.2 to 4.0 per cent of all patients with urogenital calculi have hyperparathyroidism as the underlying condition (73). Cook and Keating found that 2 per cent of their patients with renal calculi had hyperparathyroidism as the etiological factor, and considered that this figure was lower than it actually should be as only a small portion of their patients had a sufficiently thorough metabolic work-up to completely exclude hyperparathyroidism (20).

With this contribution to the general problem of hyperparathyroidism, the protean manifestations of the disease were more completely recognized which led to an increased frequency of diagnosis. This point is well illustrated by the fact that between 1903 and 1925, a period of 23 years, 26 parathyroid adenomas were discovered as autopsy findings and 1 adenoma was removed as a surgical specimen. Between 1926 and 1945, a period of 20 years, only 42 adenomas were reported as autopsy findings while 295 were removed surgically.

For a complete and interesting account of the historical development of the parathyroid glands, the reader is referred to Fuller Albright's paper, "A Page from the History of Hyperparathyroidism."

CLASSIFICATION OF PARATHYROID DISEASE

The following classification of parathyroid diseases is offered as a comprehensive one to include all pathologic conditions of the parathyroids which have been recorded, whether they be primarily of medical or surgical interest. The important group of parathyroid lesions are those related to primary hyperfunction and which are, therefore, of surgical interest.

- I. Primary hyperparathyroidism, due to
  - A. Functional parathyroid adenoma (47)
    1. Single
    2. Multiple
  - B. Diffuse parathyroid hyperplasia (3)
- II. Carcinoma of the parathyroid glands
  - A. Functional (primary hyperparathyroidism) (64)
  - B. Nonfunctional (14)
- III. Secondary parathyroid hyperplasia (35, 37) due to:
  - A. Chronic renal insufficiency
  - B. Vitamin D deficiency
  - C. Rickets
  - D. Multiple myeloma
  - E. Osteomalacia
  - F. Paget's disease
- IV. Cysts of the parathyroid glands (59)
- V. Nonfunctioning parathyroid adenoma (47, 55)
- VI. Hypoparathyroidism
  - A. Surgical tetany (37, 41, 52)
  - B. Secondary (49) due to:
    1. Hemorrhage
    2. Tuberculosis (81)
    3. Amyloidosis
    4. Syphilis
    5. Infarction (63)
  - C. Idiopathic hypoparathyroidism (46)
    1. Congenital absence of the glands
    2. Congenital hypoplasia secondary to maternal hyperparathyroidism.
- VII. Primary parathyroid atrophy (4, 78)
- VIII. Pseudohypoparathyroidism; a genetic disorder (35)

In this thesis only those parathyroid lesions which are of surgical interest will be considered in any detail. These encompass primary hyperparathyroid states regardless of the underlying condition, carcinoma of the parathyroids, and to some degree secondary hyperparathyroidism because of the importance of differentiating the

primary from the secondary forms. It has been correctly stated that in considering parathyroidectomy the burden of proof rests on the surgeon to exclude secondary hyperparathyroidism (16). Surgical intervention is indicated in primary hyperparathyroidism as a lifesaving procedure, but is contraindicated in secondary hyperparathyroidism.

PATHOLOGICAL PHYSIOLOGY OF PRIMARY HYPERPARATHYROIDISM

The classical laboratory findings of hyperparathyroidism are hypercalcemia, hypercalcinuria, hypophosphatemia, and hyperphosphaturia. Elevated serum alkaline phosphatase levels are also noted if there is skeletal involvement with increased osteoblastic activity.

These alterations have been observed clinically in hyperparathyroid states and in part have been reproduced experimentally with parathormone.

The parathyroid glands are unique among hormone-producing tissues in being independent of the pituitary gland for their own hormone production (76). At one time it was thought that the anterior pituitary lobe elaborated a trophic hormone which stimulated the parathyroid glands to parathormone production (8). It is now believed that under normal physiological conditions parathormone is elaborated in response to altered serum calcium levels (35, 76). In adenoma, functional carcinoma, and primary hyperplasia of the parathyroid glands the result of the total increase in parathyroid tissue is increased parathormone production.

There are two theories as to the mode of action of parathormone. Collip believes that the hormone acts specifically on bone, causing proliferation of the osteoclasts with the release of calcium and phosphorus. This concept is accepted by Houssay who believes that the parathyroid hormone acts directly on bone as it provokes hypercalcemia and decalcification of the bones in nephrectomized animals (36). Albright, on the other hand, believes that the primary effect of parathormone is on phosphorus excretion by lowering the renal threshold for this substance (2). Thus, when parathormone is administered the first metabolic change to be detected is a rise in phosphorus excretion and a fall in serum phosphorus. The increase in the rate of calcium excretion and the increase in the serum calcium are more sluggish and lag behind the phosphorus changes. With a decrease in serum phosphorus there is unsaturation of the blood with calcium phosphate which results in liberation of calcium phosphate from the bones.

Collip's theory has the weakness of not readily explaining the hypophosphatemia which is such a characteristic finding in hyperparathyroidism, while Albright's theory readily explains all of the blood chemistry alterations (78). It has been suggested that the site of parathormone action is on the proximal renal tubule; this action causes depression of the phosphatase activity and thereby prevents phosphorus reabsorption (35). The very existence of primary hyperparathyroidism without bone disease favors the concept that the "renal theory" is sound (12). It is possible that the parathyroid hormone has a dual mode of action compatible with the two theories propounded, with perhaps more evidence to indicate that the primary mechanism of action is on alteration of the phosphorus metabolism with secondary changes in the calcium metabolism.

It is noted by both Cope and Albright that when a certain critical level of serum calcium has been reached by parathormone injection, the blood phosphorus level rises abruptly (2). This is probably due to altered kidney function as a concomitant rise in the nonprotein nitrogen is also noted. When this critical level of 14 to 15 milligrams per cent of serum calcium is reached, the phosphorus urinary excretion falls rapidly and the serum phosphorus level rises. Thus, the late effect of parathormone on phosphorus metabolism is exactly the opposite to its primary effect. This situation has a clinical counterpart in late and advanced hyperparathyroidism with marked secondary renal damage. Under these conditions it is difficult, if not impossible, to distinguish between primary hyperparathyroidism with secondary renal insufficiency and primary renal insufficiency with secondary hyperparathyroidism.

The parathyroid hormone has not yet been isolated in pure form. Since the potency of the extract is destroyed by peptic digestion, it is probable that the active principle is protein in nature. Parathormone is administered parenterally as it is only partly and unpredictably absorbed when given orally. It is calibrated in units, one unit being equal to one one-hundredth of the amount necessary to raise the serum calcium of 100 cubic centimeters of serum of normal dogs weighing 20 kilograms, by 5 milligrams within 15 hours after subcutaneous administration (8). Tolerance to parathormone develops in time with

continued use and has been found to last as long as a year in a normal person and in a person with tetany (1). This unfortunate occurrence limits the clinical use of the extract.

By whatever mechanism parathormone functions, bone decalcification results from calcium mobilization. If there is a high enough calcium intake, the excess calcium excreted may be maintained by this intake and the skeleton may be spared. If the calcium intake is low, excretion of calcium takes place at the expense of the bones (42). When there is skeletal involvement, it is unknown why one patient develops osteitis fibrosa cystica and another develops osteoporosis (23). It is Cope's opinion that patients with renal changes alone have a milder form of the disease than do those with skeletal involvement (23). Others think that skeletal decalcification is a late stage of hyperparathyroidism.

ANATOMY AND EMBRYOLOGY OF THE PARATHYROID GLANDS

Cope and Churchill have emphasized the importance to any surgeon who undertakes parathyroid surgery of having not only a thorough knowledge of the regional anatomy of the neck but also a complete understanding of the embryology and normal and morbid anatomy of the parathyroid glands (16, 22). The anatomical position of the glands shows considerable variation which is often directly related to the embryogenesis or pathology. If the development of the glands is clearly understood, surgical exploration for them is greatly facilitated as all potential positions can be anticipated and explored in a logical and systematic manner.

The inferior parathyroid bodies arise in symmetrical fashion from the endodermal lining of the third pharyngeal pouch in proximity to the thymic anlagen. Because of their site of origin, the inferior parathyroids are also called "parathyroids III." The superior parathyroids arise symmetrically from the same basic structure in the fourth pouch in proximity to the ultimobranchial bodies and are consequently named "parathyroids IV." The dorsal wing of each third and fourth pouch thickens into a solid mass of cells representing a primordium of the parathyroids, and detaches simultaneously with the thymic or ultimobranchial tissues. The inferior parathyroid glands migrate caudally with the thymic tissue. Because their origin is from a higher level than the superior glands, and because the extent of their migration is greater, the parathyroids III show the greatest variation in position. They most frequently lose their proximity to the thymus at the level of the lower part of the thyroid gland and may be found at any point along the path taken by the migrating thymus, with the result that parathyroid bodies have been found from the angle of the jaw to the anterior mediastinum (26), but not lower than the lowermost portion of the thymus in its final position. This level, however, may be as low as the pericardium (80).

Because of the intimate relationship of the parathyroids III to the thymus, one of the parathyroids may, on occasion, be found within the thymic capsule or within the substance of the thymus gland.

The superior parathyroids, or parathyroids IV, being in proximity to the ultimobranchial bodies, do not shift their position appreciably so that their final location is less variable. They are generally located on the posterior aspect of the lateral thyroid lobes at approximately the junction of the middle and lower thirds. The fate of the ultimobranchial bodies is not entirely clear, some believing that they degenerate, while others think that there is induction or conversion of ultimobranchial tissue into thyroid tissue. To this degree these bodies may be considered lateral thyroid primordia (5).

The superior parathyroid glands lie on a plane dorsal to the inferior thyroid artery and recurrent laryngeal nerve, while the inferior glands lie on a plane ventral to these structures (57).

Parathyroid glands have been found anterior and posterior to the subclavian veins, but not posterior to the subclavian artery, indicating the path of thymic migration at this level. They have also been found in the anterior mediastinum, within the thymic capsule or substance, along the course of the carotid sheath, anterior to and within the thyroid gland, within the tracheoesophageal groove, and anterior or lateral to the aorta (26). All of these positions are probably the result of atypical embryogenesis.

In addition, the glands have also been found within the posterior mediastinum, between the trachea and esophagus, and behind the esophagus. In these instances, the atypical position more likely represents mechanical displacement, a fact which may be substantiated by tracing the blood supply.

Mechanical displacement of an enlarged parathyroid gland is considered to be due primarily to

its increased weight and volume which cause it to shift toward the thoracic inlet. When the enlarged gland approaches the thoracic inlet, it is secondarily affected by the negative intrathoracic pressure which acts to increase the displacement. It is inferred that the phenomenon of mechanical displacement occurs from the embryological fact that a parathyroid gland is never found in the posterior mediastinum, and from the anatomical fact that the glands found in this area have always had vascular pedicles from the inferior thyroid artery (22).

An excellent study of the vascular supply to the parathyroids was made by Mauro who found that in 32 superior and 44 inferior glands studied in 24 cadavers the blood supply came from the inferior thyroid artery in 95 per cent of the total number. In the remaining 5 per cent, the superior thyroid artery constituted the main blood supply, and the few glands thereby supplied were all of the superior or parathyroid IV type. Even in the case of the superior set of glands, the blood supply was derived directly or indirectly from the inferior thyroid artery in all but 4 instances (57).

If the blood supply (via a vascular pedicle) of a gland in abnormal position can be shown to take origin from the inferior thyroid artery, the gland may be considered to be mechanically displaced instead of embryogenetically displaced because in the latter case it would derive its blood supply from its immediate environment.

The parathyroid glands are usually 4 in number, consisting of a superior and an inferior pair. However, the number has been found to vary from 1 to 10, and they may be symmetrically or asymmetrically arranged (26). In autopsy studies 80 per cent of cases are found to have four parathyroid glands while 6 per cent have more than 4 glands and 14 per cent have fewer than 4 (55).

Recognition of pathological changes that may occur in the parathyroid glands is essential at the time of parathyroidectomy. In order to recognize such changes the variation of the normal gross anatomy of these structures must be known.

The parathyroids vary in size, shape, and color. In size they generally fall within the limits of 4.0 to 15.0 millimeters in length and 3.0 to 4.0 millimeters in width.

The color of the glands varies with the amount of fat present, this usually being determined by age. They are light pink in the young but have also been described as coffee brown to reddish yellow up to puberty (35, 62). From puberty on through middle age, in the forties, the color tends to become yellowish, depending on the amount of fat accumulated by the particular individual. In older persons the color becomes a browner hue because of loss of fat, this again varying with the individual. The total weight of the normal four glands is 0.14 gram (63).

The shape of the parathyroid gland varies from spherical to ovoid, depending on the consistency of the surrounding structures. Thus, the gland may be ovoid if lying in loose areolar tissue, and may be flattened if compressed between the thyroid and the larynx.

Because of their variable small size, as well as their variability of form, color, and location, the glands are easily confused with fat or lymph nodes.

The surfaces of the glands are finely granular, and the glands are enclosed in a delicate capsule over which runs a very fine vascular network which takes its origin from a small vascular hilus. The consistency of the parathyroid is firmer than that of the thyroid (62).

THE CLINICAL PICTURE OF PRIMARY HYPERPARATHYROIDISM

Primary hyperparathyroidism may be caused by parathyroid adenoma, primary parathyroid hyperplasia, or parathyroid carcinoma. The clinical picture is basically the same in all three conditions (7). Hyperparathyroidism is called primary when the parathyroid glands produce more hormone than the body requires, in contrast to the secondary form in which the increased hormone production is a pathological compensatory response to an underlying disease entity (40).

Clinically, primary hyperparathyroidism is most frequently an insidious disease of chronic nature. The symptoms produced by the disease are extremely variable and nonspecific and are generally considered in three categories (55):

1. Symptoms related to hypercalcemia
2. Symptoms referable to the transportation and excretion of calcium
3. Symptoms referable to the skeletal system

The symptoms related to hypercalcemia have as their basis a decreased response of the nerves and muscles to electrical and mechanical stimuli. These symptoms are vague in nature and entirely nonspecific. Lassitude, constipation, easy fatigability, nausea, vomiting, lethargy, anorexia, and weakness are among the general symptoms which have been observed (72).

Symptoms referable to the transportation and excretion of calcium may be general and nonspecific, such as polyuria, polydypsia, enuresis, nocturia, and dysuria.

With the abnormality of calcium and phosphorus metabolism which has been previously discussed, calcifications of the urogenital tract may occur and produce symptoms specifically referable to such complicating lesions. In the presence of an increased urinary calcium output, there is supersaturation of the urine by calcium. Since the phosphate ion is also in excess, in the presence of an alkaline urine in which phosphate is most insoluble, precipitation occurs in the form of calcium phosphate calculi. If oxalate is present and the urine is acid, calcium oxalate will precipitate as calculi as the oxalate is more insoluble in an acid medium. The precipitation and calculus formation may occur anywhere in the urinary tract, but most commonly they are found in the ureter, kidney pelvis, or bladder. Prostatic concretions have also been observed. Symptoms directly referable to these calculi may then constitute the presenting clinical picture (23). Nephrocalcinosis may also occur, consisting of metastatic calcifications throughout the renal parenchyma and largely involving the collecting tubules. Sclerosis and kidney contracture result. With impairment of renal function, which may result from urinary tract calcification, the kidney fails to excrete phosphorus, and this is reflected in a rising serum phosphorus level and a secondary fall in serum calcium. A compensatory mechanism then takes place with excretion of excess calcium by the large bowel (55). In primary hyperparathyroidism which has progressed to this advanced stage it is difficult, if not impossible, to distinguish the condition from secondary hyperparathyroidism with renal failure as the underlying cause.

It is believed by Lahey and Haggart that the renal picture in primary hyperparathyroidism indicates the severity of the disease while the skeletal picture indicates the duration of the disease (80). Snapper believes that skeletal decalcification must be a late stage of the disease (73). Keating and Cook, however, feel that the severity and duration of the disease are not related to the presence or absence of bone lesions, and that the bones may be spared if the calcium intake is unusually high (42).

The renal disease associated with primary hyperparathyroidism has certain clinical features which distinguish it from the usual type of chronic nephritis. Hypertension, cardiac enlargement, edema, and retinal exudates are usually absent or inconspicuous when the disease is associated with hyperparathyroidism (11).

One case has been reported by Jelke in which there was renal damage to the extent that there were numerous parenchymal renal calcifications and a nonprotein nitrogen of 171 milligrams per cent. Following the removal of an adenoma, the nonprotein nitrogen returned to normal levels and the areas of calcification were reduced in number and size 2 years following surgery (39). However, this case was an extreme example, as the seriousness of primary hyperparathyroidism is largely in the irreversible renal changes which take place in advanced cases. Despite surgical removal of the tumor or hyperplastic glands, when renal damage is advanced the process is irreversible and progressive, ultimately ending in death. It is because of this irreversibility of a complicating lesion that hyperparathyroidism is a serious disease which may terminate fatally.

Cook and Keating have also noticed dissolution of calcifications following parathyroidectomy (20).

Hyperparathyroidism should be considered in every case of urinary tract calculi, and should be even more highly suspected in cases of recurrent calcification in the urinary tract (12, 45).

Changes in the skeletal system resulting from primary hyperparathyroidism generally fall into two groups: classical osteitis fibrosa cystica and, less commonly, generalized osteoporosis. Pathological fractures represent the most common clinical manifestation of the presence of these bony lesions and usually involve the long bones and vertebrae. Skeletal deformities such as kyphosis, leg bowing, and pigeon breast may also be seen, and poorly defined skeletal pain and bone tenderness may be present (40, 75). Bone swelling due to so-called "brown tumor" and cysts involving the jaw, metacarpals, and ends of the long bones have also been noted (37, 40). The maxilla has been reported as the site of cystic changes and tumor swelling as the first clinical indication of the presence of hyperparathyroidism (79).

In extensive bone disease, abnormal metaplasia of bone may result in dental malocclusion and prognathism. Epulis is fairly common. Teeth are unaffected by the demineralization process and caries is, if anything, reduced. However, the teeth often fall out because of resorption of the underlying bone (40).

It has been suggested that there is a possibility that osteitis fibrosis cystica may occur in the absence of parathyroid adenoma or hyperplasia, and that spontaneous remissions of the bone disease may occur (27). The evidence to support this concept is of dubious character.

X-ray evidence of skeletal changes in hyperparathyroidism is variable. In mild skeletal changes there may only be reduction in bone density. Generalized marked osteoporosis may be noted. In classical osteitis fibrosa cystica there is miliary osteoporosis, fibrocystic changes in the skeletal architecture, subcortical cysts, fractures, large cystic lesions, and deformities. The entire skeleton is involved, particularly the skull and long bones (40). Both patellae have also been involved, as shown radiologically (17). Generalized osteoporosis with a single large cystic lesion through which a pathological fracture has occurred has also been described (34).

Localized cystic bone changes in the carpals and malleoli have also been reported as atypical lesions (50).

Resorption of the lamina dura about the teeth is regarded as x-ray evidence of bone disease secondary to hyperparathyroidism (75).

Cope reported 78 cases of primary hyperparathyroidism collected over a period of 12 years (1932 to 1944) and found that 31 per cent showed bone changes alone, 14 per cent showed skeletal decalcification and renal calculi, and 55 per cent showed renal stones alone (23). Of the cases with only skeletal changes, 23 showed classical osteitis fibrosa cystica and 1 case showed osteoporosis. While it is unknown why one patient with primary hyperparathyroidism develops osteitis fibrosa cystica and another diffuse osteoporosis, Cope believes that it is possible that the lack of sex hormones in older individuals may be important in effecting regeneration of the bone matrix with osteoporosis as the result.

While primary hyperparathyroidism is usually a chronic disease, it has been stated that on rare occasions it may be acute (58). Acute parathyroid poisoning simulates the state which can be reproduced in the experimental animal. There is a rapidly increasing serum calcium level, inspissation of the blood, failure of urinary phosphate excretion, combined high serum calcium and phosphorus levels, and, finally, precipitation of calcium phosphate in the tissues (10). Precipitations of calcium under these conditions have been observed in the kidney, lung, stomach, and heart (11). These episodes may occur as crises in which the patient shows restlessness, tachycardia, and prostration. Death may result (63).

It is important to remember that the diagnosis of primary hyperparathyroidism is usually considered only when the disease has progressed to the stage of complications involving either the skeletal or urological systems. This implies that the disease has already been present an appreciable period of time. From an analysis of the data collected in 322 cases of parathyroid adenoma, Norris thought that the tumors had been present from 5 to 7 years prior to recognition. In 1 case there was evidence that the adenoma had been present for 39 years (63). The symptoms produced by the blood chemical changes alone are entirely nonspecific and nondiagnostic.

PARATHYROID ADENOMA

Parathyroid adenomas constitute the single largest group of lesions which account for primary hyperparathyroidism. This disease can no longer be considered a curiosity. Approximately 600 cases of primary hyperparathyroidism have been recorded in the literature and all but a small number of these have been due to adenoma (70).

Adenomas occur more frequently in the inferior or parathyroid III glands without significant difference in the side of involvement. At least 75 per cent of adenomas develop in the lower glands and the remainder in the superior glands (14). In one series of 197 collected cases, the statistical breakdown as regards location was as follows: 84 (43%) in the right lower gland, 81 (41%) in the left lower gland, 18 (9%) in the right upper gland, and 14 (7%) in the left upper gland (63).

The adenoma is aberrant in a significant percentage of cases. In the first 100 cases of primary hyperparathyroidism in the Massachusetts General Hospital series, 20 per cent of the adenomas had aberrant locations (14). In 281 cases in the series collected by Norris, 30 (10%) of the adenomas were in aberrant positions. Of these 30 adenomas, 19 were in the mediastinum, 9 were within the substance of the thyroid gland, and 2 were behind the esophagus (63).

The status of multiple adenomas is probably not completely determined. Castleman reports that 2 adenomas were found in each of 6 patients. In 4 of the cases, the multiple tumors were found at the time of the first operation and in the 2 remaining cases the second tumors were found

5 and 9 years later, respectively, at subsequent operations (14).

In 1947, Norris questioned the validity of the concept of multiple adenomas, pointing out that of 20 cases referred to at that time, only 2 were reported subsequent to 1938. Of the 20 patients, 12 had advanced renal disease, and regarding some of the remainder, the information available was too meager for accurate analysis. Norris thinks that since secondary parathyroid hyperplasia due to renal insufficiency is accepted, the burden of proof rests on each investigator to show absence of renal disease in cases of multiple enlargements thought to be adenomas (63).

One case of multiple enlargement of the parathyroids has been reported which was considered to be unclassifiable by the authors. In this case of hyperparathyroidism with classical chemistry alterations, three large cervical glands which showed hyperplasia of the wasserhelle cell type (see below) were removed. There was no clinical improvement or blood chemistry changes following the operation. One month later mediastinal exploration was done with the removal of a tumor the size of a hen's egg which histologically showed nests of wasserhelle cells smaller than those seen in the previous specimens. Following this operation, the patient developed tetany and a permanently low serum calcium (50).

Adenomas have been reported in each decade of life from the second to the eighth, inclusive. No case has ever been reported in a child under 10 or in an adult over 80. The sex incidence is 3 females to 1 male. There is no apparent geographical influence on the incidence of parathyroid adenoma (63).

Grossly, an adenoma is usually ellipsoidal in shape with three unequal axes, but it may be round, bilobed, or angular. It has been suggested that bilobed adenomas may be mistaken for multiple adenomas if the lobulation is marked. Externally, the tumors are smooth and soft and of variable texture. Their consistency may be similar to that of the normal spleen, but if there is sufficient increase in the stromal tissue in the septal bands the consistency may be much firmer. At times, calcification of the capsule or connective tissue septae has been observed. Hemorrhage is a frequent complicating feature, and it is probable that the small cystlike spaces so often encountered are posthemorrhagic phenomena (63). Adenomas are always encapsulated. This is of importance in differentiating adenoma from carcinoma of the parathyroid at the time of operation.

On section, the surfaces of adenomas are moist and homogeneous in appearance and vary in color from yellow to reddish or orange brown (14, 63).

The weight of an adenoma shows great variation. In 80 cases in which the weight was recorded, the range was from 0.5 to 120.0 grams, the average weight being 12.47 grams and the median weight 7.0 grams (63).

According to Castleman, there is a rough correlation between the size of the adenoma and the level of the serum calcium—the higher the serum calcium level, the larger the adenoma (14). However, as the size of the tumor increases, the proportional effect of unit weight of the blood calcium becomes rapidly less and less. If this were not so, the patients with the very largest adenomas would suffer from parathormone poisoning, which is uncommon.

The histology and cytology of the parathyroid adenoma are probably the most confused phases of this pathologic entity. Since Welsh, in 1898, first described the histology of the parathyroid glands, based on 40 cadaver specimens, subsequent investigators have introduced their own terminology until at the present time there is considerable confusion even in such a basic matter as the number of cell types found in the normal parathyroid gland. Because of this confusion, it has been difficult to correlate the cell type with function (63).

The term adenoma has been disputed as appropriate because the cellular constituents usually do not form glands as is connoted by this term. In most instances, parathyroid adenomas have a histological picture of large islands or bands of contiguous cells. Only at times is there an attempt at true acini formation. Pseudoglandular formation around a blood vessel is not uncommon. As cystic degeneration is common, small spaces lined with a single layer of cells and filled with a fluid similar in appearance to thyroid colloid are often seen (14). Castleman thinks that these tumors should be called parathyroidomas (15).

In 1935 Castleman and Mallory described four cell types in parathyroid adenomas: the pale principal cell, the dark principal cell, the dark oxyphilic cell, and the pale oxyphilic cell. It was their feeling that the pale principal cell was the primary cell from which the others arose in the

order listed (26). On the basis of this classification, the basophilic pale principal cell comprises the bulk of the gland but decreases relatively with advancing age, while the dark principal cells increase relatively with age. The oxyphilic cell types are comparatively few (26).

In 1947 Norris recommended a terminology based on a study of 1,665 human parathyroids. His cell types included primordial cells, vesicular cells, clear cells, dense cells, dark cells, and oxyphilic cells.

Hoffman in 1952 mentions, in addition to other cell types, the palisade cell which borders the sinusoids of the gland (35).

Castleman, in 1952, revised his earlier classification of cell types. He believed the earlier classification was too narrowly drawn and that there is really only one cell type, the chief cell. All other apparent cell types represent variations in the life cycle of the chief cell. The water clear, or wasserhelle, cell is considered to be a chief cell with a more vacuolated cytoplasm probably due to hyperfunction. The oxyphilic cell, on the other hand, is considered to be an involuted nonfunctioning cell (14).

This simplified concept is probably the most valid of all classifications. Many case reports of hyperfunctioning parathyroid adenomas have described the histopathology as showing chief cells or a mixture of chief and wasserhelle cells (30, 42, 72, 73, 75). On the other hand, an adenoma composed solely of wasserhelle cells has been described by Castleman and Parris (15), although it was conceded that this variety of adenoma is uncommon.

Marshall states that, microscopically, adenomas are composed of chief cells and hyperplastic glands are composed of wasserhelle cells (55). Churchill, in analyzing 21 cases, found that in 3 of the cases due to hyperplasia of the parathyroids the wasserhelle cell type was found, while in the remaining 18 cases (which were adenomas), chief cells, oxyphilic cells, and at times wasserhelle cells were seen (16). Castleman feels that this variability of cells in an adenoma may be considered further evidence that the oxyphilic and wasserhelle cells are transitional stages of the chief cell (14).

On the basis of cellular constitution, the oxyphilic adenoma is probably the rarest form (63). Norris collected 4 cases including his own in 1946, and in 1947 Schneider *et al.* reported another case associated with hyperfunction (75). In the latter case, there was a family history of a relative with a similar tumor. As oxyphilic cells are increased with the age of the individual, and as the oxyphilic cell is an involuted chief cell, functional activity of the tumors of this cell type would not be expected. Castleman feels that oxyphilic adenomas may represent a previously active adenoma which has completely involuted (14). However, no case of a benign parathyroid tumor not associated with excess of parathyroid hormone has ever been reported. Cope reports an incompletely worked up case in which an adenoma which was composed of pale oxyphilic cells was removed. There was no preoperative evidence of tumor in this case, and there was no postoperative tetany (23).

CARCINOMA OF THE PARATHYROIDS

Carcinoma of the parathyroid glands is a very rare lesion but one which is of importance not only because of the element of malignancy but also because it is a cause of primary hyperparathyroidism.

In 1948 Norris collected 41 cases in the literature which had been considered carcinoma of the parathyroids and subjected them to careful scrutiny. He concluded that only 15 of this series were sufficiently well documented to be accepted as carcinoma. An additional 3 cases in this series were classified as questionable, and 23 were excluded as unacceptable to the category of carcinoma. The first acceptable case was reported in 1909 by deQuervain. Local invasion and distant metastases to the lymph nodes, lung, and liver occurred in this case (64).

Subsequent to the collective review by Norris, case reports have appeared sporadically in the literature. In 1949 deWesselow reported a case with multiple recurrences following repeated excisions and x-ray therapy. At the time of the last surgical procedure, a fibrotumorous mass was found adherent to the larynx and esophagus, extending from the cricoid cartilage to the aortic arch. Marked skeletal involvement was present in the form of osteitis fibrosa cystica (24).

In 1950 Stephenson reported another case of parathyroid carcinoma which was also characterized by local recurrence, local invasion into the muscle, lymphatics, and thyroid, and termination in death. This tumor was also functional (77).

Bertrand-Fontaine reported a case in 1950 which appeared to take origin in the area from

which an apparently benign adenoma was removed. A year following the removal of the adenoma (the symptoms of hyperparathyroidism having been ameliorated during this period), there was a local recurrence of a tumor mass with recurrent evidence of parathyroid hyperfunction. Two subsequent surgical procedures, including a complete block dissection, were done, but there was a fatal termination. The skeletal system was involved in this case (7).

In 1950 King reported another case of parathyroid carcinoma with fatal termination. Extensive bone involvement produced the first clinical evidence of the disease. The serum calcium level was 19 milligrams per cent. A large parathyroid tumor was surgically removed with amelioration of the symptoms and the blood calcium dropped to normal levels. Histologically, the tumor was composed of well differentiated parathyroid cells, but there was subsequent recurrence of hyperparathyroidism with death occurring 4 years following surgery. Postmortem examination revealed metastatic nodules of parathyroid tissue in both lungs. It was noted again that the microscopic picture was compatible with a benign parathyroid tumor. The patient's skeleton was so decalcified that it was easily cut with a knife. Because of the malignant course of this tumor in the face of a microscopically benign lesion, it was concluded that the present histological criteria for diagnosing carcinoma of the parathyroid are inadequate (43).

O'Donovan reported a case of parathyroid carcinoma, in 1951, in which there were classical serum chemistry alterations of hyperfunction. The tumor was found to be locally invasive to the thyroid gland and loosely adherent to the esophagus and trachea. Postoperatively, symptoms of parathyroid insufficiency appeared on the fifth day. There was extensive local recurrence 13 months following surgery and subsequent x-ray therapy brought no relief or improvement. The patient expired with increasing signs of parathyroid insufficiency; no autopsy was obtained (65).

Castleman, in 1952, reported that in the Massachusetts General Hospital series of 100 cases of primary hyperparathyroidism, 3 were due to carcinoma. These 3 cases were not included by Norris in his collective review (14).

The total number of collected cases of parathyroid carcinoma which are sufficiently well documented to be acceptable is only 23. Because of the smallness of this series, it is not appropriate to attempt a statistical analysis of this disease entity. Certain general observations, however, are worthy of note.

Carcinomas of the parathyroid glands are usually larger than adenomas and are more frequently palpated (14). This was true in 13 of the 15 cases collected by Norris (64).

Sites of metastases which have been proved at autopsy include the regional lymph nodes, lung, liver, and kidney.

Functional parathyroid carcinoma is widely recognized. However, nonfunctional parathyroid carcinoma is not completely accepted. Castleman feels that because of the similarity of parathyroid to thyroid carcinoma, it is safer to consider that true cases of parathyroid carcinoma are functional, admitting that on theoretical grounds nonfunctional carcinoma probably does occur (14). Meyer and Ragins believe that functional activity is necessary for the diagnosis to be accepted (60). Norris, on the other hand, feels that functional activity is not necessary for the diagnosis of parathyroid carcinoma, and in his collected series points out that in 8 of 15 cases no skeletal alterations were observed and that in one of these there was no alteration of the serum and phosphorus levels (64).

The relationship that benign adenoma may have to carcinoma is another aspect of the general problem that has caused considerable speculation. Black and Ackerman, quoted by Castleman (14), believe that local recurrence is due usually to the spillage of cells during the removal of an adenoma. Castleman does not agree with this opinion as a matter of rule, and cites as evidence the fact that at one time the Massachusetts General Hospital group did subtotal resections of adenoma in 6 patients with severe bone disease, believing that postoperative tetany would be prevented or decreased by this maneuver. In 3 of these cases there was recurrence of the hyperparathyroidism, and surgical removal of the residual adenoma was done after 5 months, 7 years, and 15 years, respectively. In none of these cases was there an appreciable growth or change in the residuum (14). He states further, however, that he has seen one case in which the histopathology and history of hyperparathyroidism of 12 years' duration strongly suggested that the adenoma did antedate the carcinoma. Norris feels that there is a strong likelihood that adenomas are precancerous.

The diagnosis of parathyroid carcinoma is based on the local findings of invasion at the time of surgery, evidence of metastases, and the subsequent course of the patient rather than on the cytological picture of the tumor. In 1944 Pemberton and Alexander reported a series of 14 cases of primary hyperparathyroidism which had been observed at the Mayo Clinic up to 1942. A diagnosis of carcinoma was made in 13 of these cases and a diagnosis of adenoma in the remaining case. These diagnoses were made entirely on cytological evidence of what were considered malignant characteristics. Irregularity of the size and staining power of the nuclei, a densely staining chromatic network, giant nuclei, mitotic figures, pathological mitoses, prominent nucleoli, irregular cellular arrangement, and invasion of the capsule and blood vessels by tumor cells comprised the criteria for the diagnosis of malignancy. While these are generally acceptable criteria for such a diagnosis, they apparently do not hold true for parathyroid carcinoma (67). This report has been critically analyzed on the grounds that there was no local evidence of malignancy such as local invasion of the adjacent structures and fixation to other tissues, no evidence of metastases was noted, and all of the patients did well following surgery. In contrast, there have been several reports of parathyroid carcinoma with distant metastases and fatal termination in which the tumor showed definite differentiation from normal parathyroid components but no cytological characteristics of malignancy (7, 24, 43).

The treatment of parathyroid carcinoma has a dual purpose—the removal of a tumor which has endocrine activity as well as malignant features. Since the route of metastases is to the regional lymph nodes, ideally a radical neck dissection should be done as well as removal of the primary tumor. It is well to remember that this lesion is exceedingly rare, however, and the diagnosis must be firmly established before such a radical procedure is undertaken. It has been suggested that it is perhaps wiser to err on the side of conservatism and follow up the patient for evidence of recurrence of hyperparathyroidism (14). It has been shown repeatedly that the metastatic lesions of functional parathyroid carcinoma are also functional.

X-ray therapy has been used a number of times for local recurrences but without success (12, 32, 60, 64).

PRIMARY PARATHYROID HYPERPLASIA

This lesion constitutes the third cause of primary hyperparathyroidism. Like carcinoma of the parathyroid, it is a rare lesion; only 29 cases could be found in the literature in a review by Albright and Kerr in 1952 (3). This entity was not recognized until 1934 when Albright, Castleman, and Churchill reported 3 cases.

In this disease, all of the parathyroid glands are involved in a process of hyperplasia and hypertrophy.

The gross appearance of the glands is in sharp contrast to that of adenoma or carcinoma. All of the glands are encapsulated and irregular in shape, and they may have pseudopod projections. The glands are soft in consistency and are dark brown in color. Castleman has made the observation, based on 10 cases, that the superior set of glands is almost invariably of larger size than the inferior pair and he has noted this finding to be recorded in other case reports which have appeared in the literature. The reason for this discrepancy in size is unknown (14).

The microscopic picture of primary parathyroid hyperplasia is consistent in its cellular component, as only the wasserhelle cell is found (14, 23). The wasserhelle cell is polyhedral in shape and contains a clear cytoplasm. The nuclei are round to oval and may be multiple. The low power picture is similar to that of clear cell carcinoma (hypernephroma) of the kidney. There is variation in the cellular arrangement from broad solid sheets to acinar formation. In almost every instance there is present some degree of cell membrane degeneration together with the formation of microscopic and macroscopic cysts (14).

Cope presumes that the original stimulus to primary parathyroid hyperplasia and hypertrophy is different from that of parathyroid adenoma because of the difference in organ response (23).

The clinical picture produced by the hyperplastic glands is similar to that produced by adenoma and carcinoma, with the striking feature that all of the cases reported have shown urinary tract calcifications. Only a few have demonstrated skeletal involvement and this, when present, has usually consisted of mild decalcification (14).

One case has been reported in which nephrolithiasis, pancreatic lithiasis, and mild osteitis fibrosa cystica were found at autopsy (71).

PARATHYROID CYSTS

Parathyroid cysts rarely attain a size large enough to warrant surgery in themselves. Microscopic or nearly macroscopic cysts of the parathyroids are very common, and it is thought by some that if enough sections were made of all four glands on cadavers, such cysts would be found in every case (59).

The origin of such minute cysts is not clear. Four explanations have been offered with regard to the etiology of the cysts. Castleman believes that they are the result of degeneration (14). McGoon *et al.* feel that they are due to retention of secretions in the frequently encountered colloid vesicles within the gland or that they are derived from developmental remnants located near or incorporated within the glands with origin in the third or fourth pharyngeal pouches (59). Norris has suggested that they may represent posthemorrhagic phenomena (63).

Cysts large enough to warrant surgery are rare. In reporting 3 such cases in 1951, McGoon collected 8 other cases. The first of these was reported in 1906 by Goris. Five cases were subsequently reported in the foreign literature and 3 in the American literature. Including the 3 reported in 1951, a total of 11 cases has been recorded (59).

In this series of 11 cases, only 1 was associated with hyperparathyroidism. In this case, a 200 gram parathyroid adenoma was removed and the cyst on the opposite side of the neck, being found to involve another gland, was removed at the same time.

The cysts have been found to vary from 1 to 5 centimeters in diameter.

Parathyroid cysts of macroscopic size remain a pathological curiosity, produce no specific symptoms, but must be considered in the differential diagnosis of every cervical mass (84).

SECONDARY HYPERPARATHYROIDISM

Secondary parathyroid hyperplasia and hyperparathyroidism are relevant to the main topic of this thesis because the differential diagnosis between the primary and secondary forms is of practical importance. This is exemplified by a case reported by Cope in which the clinical diagnosis of secondary hyperparathyroidism was made with the result that surgery was not considered. The patient died and at autopsy a parathyroid adenoma was found (23).

Secondary hyperparathyroidism may be due to several factors which have been recorded earlier in this article. The etiological factor of most importance is chronic renal insufficiency (14, 33).

Primary hyperparathyroidism from whatever cause is difficult to distinguish from secondary hyperparathyroidism only when the primary form presents advanced kidney damage as the result of metastatic calcification. As has been noted previously, when this occurs there is a decrease in urinary phosphate excretion with a resulting elevation in serum phosphorus and a later fall in serum calcium to normal or slightly depressed levels (14). These blood chemical alterations are characteristic of secondary hyperparathyroidism as well as of advanced renal insufficiency associated with primary hyperparathyroidism. When this situation prevails, the differential diagnosis on clinical grounds may be impossible.

The most severe example of secondary hyperparathyroidism is the so-called "renal rickets" or "renal dwarfism," in which, because the renal insufficiency occurs during the period of active growth, the generalized manifestations of the disease are extreme. Both sexes are affected; there is failure of normal growth, bony deformities, frontal bossing, dwarfism, infantilism, secondary anemia, thickening of the arteries, cardiac enlargement, and, occasionally, hypertension. Despite marked kidney damage, a rise in nonprotein nitrogen is noted only terminally. This picture may be produced by urinary obstruction at the vesical neck and may have a fatal termination unless corrected (29). Pyelonephritis or chronic glomerulonephritis may on occasion be the etiological factor (37).

The syndrome of chronic renal disease producing secondary hyperparathyroidism in adults is uncommon (33, 37). It is possible to have an adenoma of a parathyroid gland produce sufficient calcium deposits in the kidneys so that even following removal of the tumor, the chronic renal insufficiency induced by the calcifications will result in secondary involvement of the remaining glands (14).

The gross and microscopic characteristics of the parathyroid glands in secondary hyperplasia are characteristic and easily differentiated from either adenoma or primary hyperplasia. Grossly, the glands in secondary hyperplasia rarely reach the size of an adenoma or the glands of primary

hyperplasia. The glands tend to be creamy gray in color rather than yellow-brown. In consistency, they are firmer and less pliable than the normal gland, the adenoma, or the glands of primary hyperplasia (14).

The microscopic characteristic which immediately determines secondary hyperplasia is the fact that the main cellular constituent is the chief cell (14). In addition, there is lack of cell uniformity. There is typically a mixture of cell types with a greater number of oxyphilic cells than in the normal gland. In certain cases, smaller than normal wasserhelle cells may also be present in small numbers (83).

Diagnosis of Primary Hyperparathyroidism

When the diagnosis of primary hyperparathyroidism is first suspected on clinical grounds, it is necessary to turn to laboratory measures to confirm the clinical impression.

The four chief characteristic and classical findings which confirm the diagnosis are hypercalcemia, hypophosphatemia, hypercalcinuria, and hyperphosphaturia. In addition, if there is any degree of bone involvement with increased osteoblastic activity, there is an increase in the serum alkaline phosphatase.

The problem, however, is not generally of such easy solution for several reasons. Determination of the serum calcium level must be repeated several times if it is initially found to be normal as the disease may be in remission at the time the first determination is made (23). Hypercalcemia is considered to be a crucially important chemical finding in the diagnosis, according to Jaffe, but there are several other diseases which may also cause this elevation and these must be excluded. Elevated serum calcium levels are observed in hyperproteinemia and high vitamin D therapy, and may be found in multiple myeloma, prostatic carcinoma, sarcoidosis, neurofibromatosis, and metastatic carcinoma (25, 70). If the hyperparathyroidism is advanced and has caused renal insufficiency, the serum calcium level may be normal or even slightly depressed, secondary to phosphate retention (37).

Rienhoff credits Howard for having found a simple method of differentiating the hypercalcemia due to hyperparathyroidism from all other types of hypercalcemia. Cerebrospinal fluid, which has a normal calcium content range of 4.5 to 5.5 milligrams per cent, is altered little or not at all in abnormal parathyroid states, while in all other conditions causing hypercalcemia, there is elevation of the cerebrospinal fluid calcium level (70).

Serum calcium is in two fractions: a diffusible ionic and a nondiffusible protein-bound form. The nondiffusible form constitutes from 40 to 45 per cent of the total serum calcium (25, 38). Most of the protein-bound calcium is bound by the albumin fraction (38). Calcium proteinate is not affected by parathormone (55). Alterations in plasma protein levels may therefore affect the calcium determinations, which in turn may obscure the diagnosis of actual hypercalcemia or lead to the false assumption of hypocalcemia (25). Marshall feels that reduced protein levels can lead to an erroneous diagnosis of parathyroid overactivity (55). Empirical formulas have been developed in an attempt to express the relationship between the diffusible and protein-bound calcium fractions in disease, but have been found to have limited application (38). In the absence of renal insufficiency, or hyperproteinemia, it has been estimated that 1 gram of protein binds approximately 0.75 milligrams of calcium (25). It is important, despite the limitations involved, to determine the plasma protein levels at the same time as the calcium levels and to consider these values in relationship to the clinical picture as a whole.

The normal serum calcium levels determined after a fast of 12 hours, as given by Jaffe and Bodansky, are (38):

Adults: 9.5 to 10.5 mgm. per cent
Children: 10.0 to 11.5 mgm. per cent
Neonates and other infants: 10.5 to 12.0 mgm. per cent

Hypocalcemia is represented by a value 1.0 milligram per cent or more below these ranges, and hypercalcemia by an increase of 1.0 milligrams per cent or more above these ranges.

Hypophosphatemia is considered by Cope to be more reliable than the finding of borderline high calcium levels provided there is increased urinary calcium excretion (21). It must again be remembered, however, that in advanced cases with renal impairment, an elevation of serum phosphorus may result. As this elevation is also found in secondary hyperparathyroidism, as well as in hypoparathyroidism and high vitamin D therapy (which are of less diagnostic consequence), it is in itself nondiagnostic but must be correlated with other chemical alterations and the clinical picture (37, 38).

The normal serum phosphorus levels as given by Jaffe and Bodansky are (38):

Adults: 2.5 to 4.0 mgm. per cent
Children: 4.5 to 5.5 mgm. per cent
Infants: 5.5 to 6.5 mgm. per cent

With the possible exception of infant values, 0.5 milligram per cent below the normal lower range limit represents hypophosphatemia, and 1.0 or more milligrams per cent above the upper normal limits represent hyperphosphatemia.

Hypercalcinuria is essentially an expression of negative calcium balance, and when properly determined is an important aid in diagnosis. The Sulkowitch test to determine increased urinary calcium excretion is widely used for this purpose (75). The reagent consists of oxalic acid 2.5 grams, ammonium oxalate 2.5 grams, glacial acetic acid 5.0 cubic centimeters, and distilled water to make 100 cubic centimeters. When added to equal parts of acidified urine, in the presence of excessive amounts of calcium, a heavy white precipitate forms. Normally none or a faint precipitate is found (73). A positive Sulkowitch test *per se* is not diagnostic as it may be observed not only in hyperthyroidism, but also in hyperparathyroidism, metastatic carcinoma of the skeletal system, high vitamin D therapy, and occasionally in Paget's disease and multiple myeloma (25). In addition, the test has the further disadvantage of not being positive constantly in the presence of primary hyperparathyroidism. In 2 of 6 cases of the series reported by Pemberton and Alexander in which the test was used, it was negative. The Lahey Clinic has had a similar experience with negative Sulkowitch tests, which were observed in 2 of 22 cases of proved hyperparathyroidism (55). In a case report made by Keating and Cook the test was negative on the first occasion and positive when repeated. These authors grade the interpretation of the precipitation on a one to four basis and feel that the test should be considered positive only when grade 3 or 4 is present (42).

Quantitative determinations of urinary calcium excretion have been recommended as another method of determining hypercalcinuria. On a daily diet of 2,000 calories containing 125 milligrams of calcium, the normal urinary excretion of calcium is under 100 milligrams a day. In hyperparathyroidism more than 200 milligrams of calcium is excreted in the urine each day under these dietary conditions. If the calcium excretion is between 150 and 200 milligrams the presence of hyperparathyroidism should be strongly suspected (41, 45).

Hyperphosphaturia is the fourth classical chemical alteration observed in hyperparathyroidism. For some reason, which is not readily apparent, it has not been used by clinicians for establishing the diagnosis of hyperparathyroidism. A possible explanation for this curious fact is that the other alterations produced by the disease have been relied upon, and have sufficed for making the diagnosis without the necessity of utilizing this test. Experimental work done in 1929 by Albright and others, in studying the effect of parathyroid hormone on calcium and phosphorus metabolism, has shown that hyperphosphaturia occurs (2).

Serum alkaline phosphatase levels are elevated in primary hyperparathyroidism only when there is skeletal involvement. Elevation of the phosphatase level is therefore entirely nondiagnostic in itself, as it results from many skeletal diseases, both primary and secondary to other lesions of which hyperparathyroidism is only one (25, 37). Paget's disease, osteoblastic metastatic carcinoma, and osteogenic sarcoma will also cause elevation of the serum alkaline phosphatase (37). Furthermore, the serum alkaline phosphatase may be elevated in disease not related to the parathyroid glands or the skeleton.

In addition to the chemical alterations which are anticipated in primary hyperparathyroidism, the diagnostic adjunct of x-ray study is of great value in the cases in which there is clinical evidence of skeletal disease or an increased serum alkaline phosphatase.

Pugh has recently pointed out that the generalized alteration of bone structure caused by primary hyperparathyroidism, consisting of a disordered arrangement of the trabecular structure, generalized decalcification, and cystic changes, is even now not of great assistance in establishing the diagnosis with accuracy, because these changes may occur with other diseases, especially fibrous dysplasia. However, there are skeletal changes in three specific sites which in his opinion are always present when the generalized bony alterations are seen and which he considers to be pathognomonic of primary hyperparathyroidism. In order of importance, the sites are: the phalanges of the hand, the lamina dura around the teeth, and the skull (68).

The bony structure of the hand shows generalized decalcification, but what is most signifi-

TABLE I.—COMPARATIVE BLOOD AND URINE CHEMICAL ALTERATIONS IN VARIOUS DISEASES

	Serum				*Urine*		*Feces*	
Condition	*Ca*	*P*	*AP**	*pH*	*Ca*	*P*	*Ca*	*P*
Hyperparathyroidism	I	D	N-I	N	I	I	N	N
Hyperthyroidism	N	N	N-I	N	I	I	I	I
Paget's disease	D-N	N	I	N	N-I	N	N	N
Multiple myeloma	N-I	N	N		N-I	N-I		
Rickets	N	D-N	I		D	D		
Osteomalacia	D-N	D	I	N	D	D	D	D
Idiopathic steatorrhea	D-N	D-N	N-I	N	D	D	I	I
Renal rickets	D-N	I	I	N	D	D	D	D
Osteogenic sarcoma	N	N	N-I		N	N		
Metastatic carcinoma	N-I	N	N-I		I	I		
Prostatic carcinoma	N-I	N	I					
Neurofibromatosis	N-I	D-N	N-I					
Uremia-renal insufficiency	D	I	N		D	D	I	
Regurgitation jaundice			I					
Lipoid granuloma of bone	N	N	N		N			
Hyperproteinemia	I	N						
Hypoproteinemia	D	N						
Acidosis	N	N		D				
Alkalosis	N	N	N	I	N	N		
Hypoparathyroidism	D	I	N	N	D	D	N	N
High vitamin D therapy	I	I	N		I	I	D	D
Osteogenesis imperfecta			I					
Albright's syndrome	N	N	I					
Senile osteoporosis	N	N	N		N	N	N	N
Hypercalcemia and excess alkali intake	I	N-I	N		N			

N-normal I-increased D-decreased
*alkaline phosphatase

cant is a peculiar lacelike decalcification of the cortical bone just beneath the periosteum. This is called subperiosteal bone resorption and is best seen in the middle phalanges. This change is often accompanied by resorption of the tufts of the terminal phalanges. While Pugh considers these skeletal changes, as seen roentgenologically, to be pathognomonic of hyperparathyroidism, they are seen in both the primary and secondary forms of the disease (68).

Resorption of the lamina dura, which represents bone cortex around the teeth, is also seen roentgenologically. In some cases the loss of the lamina dura can be demonstrated while the remainder of the skeleton appears to be normal. Changes in the trabecular structure of the surrounding bone are noted and, occasionally, cystic lesions also. Since calcium is not lost from the teeth, they appear to be abnormally dense in contrast to the surrounding bone. These roentgenologic signs are not as helpful as the phalangeal changes because they are also seen in other conditions, such as osteomalacia and early Paget's disease. In addition, edentulous patients have no lamina dura, so this evidence is of no assistance in diagnosis of the condition in elderly people (68).

The least helpful of the three skeletal sites, roentgenologically, is the skull. A granular decalcification is seen, the inner and outer tables becoming indistinct. As with the phalangeal changes, however, this sign is also seen in secondary hyperparathyroidism. Furthermore, in some cases of hyperparathyroidism the skull decalcification is not typical and may resemble Paget's disease (68).

In brief summary then, it may be stated that the diagnosis of primary hyperparathyroidism is made when, in the presence of urinary tract calcification or skeletal disease of a generalized type, confirmatory laboratory data reveal classical blood and urine chemical alterations, and when classical x-ray findings are present. Other lesions which may cause similar skeletal system or blood chemical alterations must be excluded.

Table I, introduced by Flink (25) and modified by Hoffmann (35), shows the comparative blood and urine chemical alterations of the diseases which must be considered in the differential diagnosis of primary hyperparathyroidism.

PARATHYROID SURGERY

Surgery is widely accepted as the treatment of choice in primary hyperparathyroidism (9). Attempts have been made to treat the disease medically (31), but both the rationale and the results were unsatisfactory (20).

From the previous discussions dealing with the embryology of the parathyroid glands as well as the gross pathological features of parathyroid adenoma, carcinoma, and hyperplasia, it is readily apparent that a detailed knowledge of these many aspects of the situation is essential to the successful surgical treatment of primary hyperparathyroidism.

The technical difficulties in locating the abnormal glands or adenoma are considerable. A bloodless operative field and meticulous dissection are essential.

It is desirable to search in a systematic fashion for the glands. This is important for several reasons. If at least one normal gland is found, the possibility of parathyroid hyperplasia is immediately excluded as this is a diffuse process involving all of the glands (80). On the other hand, if diffuse hyperplasia is encountered, it is necessary to locate all of the glands as their number may vary widely from the usual four, and subtotal resection is necessary to the extent of leaving behind only that amount of parathyroid tissue

which approximates the size of a single normal gland. Identification of all parathyroid tissue is therefore necessary to avoid leaving behind an undesirably large amount of gland. If only four glands are found and they are hyperplastic, resection of three and one-half glands is indicated (37). Churchill feels that in resection for hyperplasia it is safer to err on the side away from tetany (16). If an adenoma is encountered, it is still essential to continue a systematic search because multiple adenomas may be present (52).

The operation may of necessity be in two stages. The first stage consists in cervical and posterior mediastinal exploration. If at this time the cause of the parathyroid overactivity can be determined and removed and the patient is relieved of hyperparathyroidism postoperatively, a second procedure may not be necessary. However, if this procedure does not reveal the cause of the hyperparathyroidism, a second operation to explore the anterior mediastinum is indicated (70, 80).

In the first stage procedure, the neck is opened by a thyroid type of incision. The strap muscles are divided for wide exposure. The region of the upper poles of the thyroid is first examined as the position of the superior parathyroid glands is more constant than that of the inferior set and is more quickly identified (22). The upper thyroid pole is released by ligating the vessels so that the posterior aspect of the thyroid gland may be examined at this point (47, 48). The superior glands are usually situated where the upper thyroid poles rest against the larynx in close relation to the horns of the thyroid cartilage (47). After identification of the superior parathyroid glands, when it is usually possible to determine whether or not hyperplasia is present, attention is directed toward the inferior pair of glands. The lower poles of the thyroid are mobilized and rotated medially. This permits access to the posterolateral aspect of the thyroid gland and if the parathyroids are not found at their most common location, ventral to and intermingling with the branches of the inferior thyroid artery and the recurrent laryngeal nerve, the search may be continued directly to the region of the pharynx and larynx, the carotid sheath, the tracheoesophageal groove, and the retroesophageal area. The posterior superior mediastinum may also be visualized at this time (70). Lahey has directed attention to the importance of tracing any branch of the inferior thyroid artery running downward, as it may be the vascular supply to a displaced adenoma which may be found in either the superior anterior mediastinum or in the areolar tissue behind the clavicle (48).

The lateral thyroid lobes should be carefully palpated for the presence of a nodule which may represent an imbedded parathyroid adenoma. If such a nodule is not located in the neck despite careful search, it has been recommended that a unilateral or bilateral subtotal thyroidectomy be done on the chance that the tumor may be imbedded in the thyroid tissue (52).

If, upon conclusion of the cervical exploration, the lesion has not been found, the second stage procedure must be undertaken. The mediastinal exploration is not carried out at the same time as the first operation (52). The neck incision is allowed to heal and the second stage is carried out after an appropriate interval.

The operative technique of mediastinal exploration begins with a vertical midline opening of the sternum from the manubrium to the third interspace. The sternum is transected at the level of the third interspace. Division of the sternum at a lower level leads to postoperative sternal instability. The sternal division from the midsternum to the third interspace is made at a 45 degree angle as an inverted V, as this configuration aids in sternal immobilization at the time of wound closure. The pretracheal fascia posterior to the sternum is separated bluntly and the pleurae are displaced laterally. The two halves of the sternum are then retracted laterally and the anterior mediastinum is fully exposed.

Exploration should now be carried out between the root of the neck and the upper reflections of the pericardium. The region of the thymus or its remnant should be searched particularly because of its embryological relationship with the parathyroids III (22). Because of the possibility that a parathyroid adenoma may be within the thymic capsule or embedded within thymic tissue, it has been recommended by Lucchetti that the thymic remnant be excised (52). The exploration is carried out anterior and posterior to the innominate vein and laterally (on both sides) to the lung roots and pleura (22).

In closure of the sternal wound, stainless steel wire is useful for approximating the bone edges. Drainage is not necessary, but all air and fluid must be aspirated from the space (22).

Recognition of a parathyroid adenoma should not be too difficult, even to the uninitiated, as the

median weight of parathyroid adenomas as calculated by Norris in 7.0 gram. This represents hypertrophy which is 200 times the size of a normal gland and 50 times the size of the total parathyroid tissue. Even in the case of the smallest adenoma in this series (0.4 gram), the tumor was still 10 times the size of a normal gland (63).

In the immediate postoperative period, the most common and important complication is hypoparathyroid tetany (37,41,52,55). This is usually of a transitory nature and is due to the fact that, because of excessive parathormone output from abnormal parathyroid tissue (usually in the form of an adenoma), there is secondary regression of the normal parathyroid tissue. With removal of the chief source of parathyroid hormone, the remaining parathyroid tissue, being in a state of repression, often cannot regain its normal function quickly enough to prevent some degree of hypoparathyroidism. The severity of postoperative tetany is greater in those cases in which there is marked skeletal involvement. Rapid postoperative absorption of calcium by bone in these cases may be anticipated particularly when the preoperative serum alkaline phosphatase level is between 10 and 20 Bodansky units (52,80). Transient tetany usually makes its appearance between the second and the fourth postoperative days (52,55). In 50 per cent of 24 cases of primary hyperparathyroidism, Keating and Cook found mild to severe postoperative tetany. In their opinion, there was a correlation between the severity of the tetany and the extent of the skeletal involvement (41).

It has been estimated that in these cases of transient tetany, from 2 to 3 months are required for the remaining glands to produce an adequate amount of hormone for disappearance of the symptoms (55).

Early manifestations of impending tetany to be watched for in the immediate postoperative period are numbness and tingling of the toes (37). During a latent stage of tetany, hyperneuromuscular excitability is elicited only on local nerve irritation or stimulation. During a manifest stage, generalized spontaneous convulsions are observed and mental aberrations are common. The serum calcium level may be as low as 4 milligrams per cent (13,53).

Measures should be taken to anticipate and avoid the actual manifestations of tetany; they consist in the administration of calcium preparations, orally and parenterally. Calcium lactate in doses of 4 gram every 2 to 3 hours, calcium lactate or gluconate intravenously in 10 cubic centimeter doses, and parathormone in supplemental doses of 10 to 20 units several times a day, have been used with success (37,55). The use of these drugs should be followed by frequent serum calcium determinations (37). AT 10, or dihydrotachysterol, has been found to be of no benefit in acute cases, but is probably the most effective single agent available for chronic cases (55).

In chronic tetany the dose of dihydrotachysterol must be determined for each individual case. The effect of the drug is not immediate and serum calcium increase is noted only after a few days of treatment. The dose of 5 to 10 cubic centimeters every day orally for 3 to 4 days, followed by a maintenance dose of 2 cubic centimeters 2 to 3 times a week has been recommended. However, because there is a cumulative effect of this drug, careful serial serum calcium determinations should be made to detect hypercalcemia (37,54). A case has been reported in which the effects of AT 10 were observed for more than 7 years. The treatment was found to be uniformly efficacious and well tolerated. Occasionally, for some unknown reason, the drug does not have the desired effect of raising the serum calcium level (54).

At one time, subtotal resection of parathyroid adenoma was utilized as a method of preventing tetany in the postoperative recalcification period when such a complication was anticipated because there was extensive skeletal involvement (22). This method of prophylaxis is no longer used (14).

Experimental work has been carried out on dogs with tetany by means of intravascular autografts and heterografts of parathyroid tissue. The technique involved flushing the parathyroid tissue through the external jugular vein in order to cause implantation into the lung parenchyma. The evidence indicated that the best results can be expected with the use of autografts. Heterografts had a palliative effect which lasted from 3 to 5 weeks (69).

Despite the results of this experimental work, the use of cultivated embryonic parathyroid tissue in human beings with tetany has been attempted. After 42 grafts were accomplished in 29 patients, 7 successful transplantations were claimed after observation periods of from 3 to 8 years (44).

Because of the ease of administration and the good results, drug treatment of tetany remains the method of choice.

In addition to the postoperative complication of tetany, either transitory or permanent, the usual complications that can follow any surgical procedure in the cervical or mediastinal areas may occur. As they are not peculiar to parathyroid surgery, they need not be considered here.

Lahey has recommended that in the postoperative recalcification period of the patients with marked skeletal disease orthopedic support in proper position be utilized so that the recalcification process does not exaggerate positions of deformity (47). Postoperative fractures have been noted in cases with skeletal involvement, and it has been suggested that the extremities with marked bone involvement be immobilized as a precautionary measure until recalcification has occurred (17).

The prognosis following parathyroidectomy depends largely on the degree of renal damage present. The skeletal changes are of less importance as they may be expected to improve (32,56,58). However, an exception to the usual recalcification process has been reported by Voltz, who found that upon 5 year follow up of a case in which removal of a parathyroid adenoma had relieved all evidence of hyperparathyroidism there was failure of recalcification (82).

Some improvement in renal function is possible after parathyroidectomy, but in most cases the damage is permanent or even progressive. Because of this, long term observation is necessary, as many patients may appear to have obtained permanent relief from hyperparathyroidism only to die ultimately of the renal sequelae (32).

OTHER CONSIDERATIONS OF THE PARATHYROID GLANDS

In addition to the widely accepted use of parathyroidectomy in primary hyperparathyroidism, the procedure has from time to time been used for other diseases, although the rationale is not clear and the results are at best inconclusive.

Salmon in 1948 made the observation that ankylosis is commonly seen in a joint in which arthroplasty has been done. He thought that this complication could be prevented by what he termed "quantitative parathyroidectomy." He presented 2 cases in which 80 and 73 milligrams of parathyroid tissue were removed and in which hip arthroplasty was also carried out. There was no evidence of ankylosis 18 months after operation. He conceded, however, that no definite conclusions could be drawn from these cases (74).

Parra, on the basis of rabbit experimental work done in 1949, came to the conclusion that the parathyroid hormone exerts a marked influence on the cardiovascular system and spleen, and mentioned that the hypothesis that this hormone plays a role in the genesis of thromboangitis obliterans is the basis for unilateral parathyroidectomy for this condition (66).

Bartels and Cattell, in 1942, reported a case of calcinosis which did not respond to medical therapy and in which unilateral parathyroidectomy was carried out with marked general clinical improvement and the disappearance of many calcium deposits after 2 years. In their case report they refer to another case which had previously been reported (6).

Parathyroidectomy has been used occasionally in the past in the treatment of scleroderma. Liuzzo reported on 2 cases in 1947 and found that no objective changes were effected. He felt that this surgical procedure for scleroderma had been done sufficiently often to warrant the conclusion that there is no relationship between the parathyroid glands and scleroderma (51).

In 1951 so-called "functional parathyroidectomy," brought about by ligation of the right inferior thyroid artery, was used in the treatment of keloids (61). The value of this procedure is very dubious.

SUMMARY

The historical development of our knowledge of the parathyroid glands in man is traced from the time of the anatomical discovery of these organs to the recognition of the part they play in disease processes.

The known pathologic physiology of the parathyroids is discussed in some detail, and an attempt is made to correlate this subject with the clinical entity of primary hyperparathyroidism.

The clinical picture of primary hyperparathyroidism and the diagnosis and differential diagnosis of this disease, on the basis of laboratory and roentgenologic study, are considered.

Parathyroid embryology, anatomy, and gross microscopic pathology are discussed in detail. The successful surgical management of hyperparathyroidism depends on a knowledge of these subjects.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Ophthalmia Nodosa Due to Caterpillar Hairs. J. A. CORKEY. *Brit. J. Ophth.*, 1955, 39: 301.

CORKEY reports a case of ophthalmia nodosa caused by caterpillar hairs and diagnosed only after the eye was enucleated. A 6 year old boy with a history of trauma and a violent, recurrent inflammatory reaction gradually lost vision in the left eye, while it remained irritable. It was enucleated and the microscopic diagnosis revealed the true pathologic process.

The literature on the subject is reviewed, and it is mentioned that this is the first case to be reported in Ireland. —*Ray Karchmer Daily, M.D.*

Generalized Choroidal Sclerosis; Course and Mode of Inheritance. ARNOLD SORSBY and J. B. DAVEY. *Brit. J. Ophth.*, 1955, 39: 257.

THE AUTHORS report data on generalized choroidal sclerosis in two families. In one there were 4 affected members in two generations, and in the other there were 10 affected members in two generations and in a collateral branch.

In the first family the disease appeared in the sixth decade and was but slowly progressive. In the early stages there was a nonpathognomonic macular lesion. Later there was exposure of the choroidal vessels, which finally became converted into white streaks, the process extending from around the disk to the central and peripapillary areas.

In the second family non-pathognomonic central fundus lesions appeared in childhood and ran a relatively mild course. Serious symptoms began generally in the thirties, but in some cases they developed earlier and later. Ophthalmoscopically, the range of appearance extended from these non-pathognomonic central reactions to central choroidal sclerosis spreading toward the periphery, in some cases associated with bone corpuscle pigment reaction at the equator.

On the basis of these two family histories, and another reported by one of the authors previously, the authors conclude that the ophthalmoscopic changes in generalized choroidal sclerosis probably follow this sequence.

1. Mottling of the central areas, reminiscent of macular dystrophy.

2. Extensive central reaction—edema, atrophy, or pigmentary proliferation—suggestive of the intermediate stages of generalized fundus dystrophy or of inflammation.

3. Exposure of the choroidal vessels in the central areas with conversion into white streaks, the beginning of a pathognomonic appearance.

4. Central lesion spreading toward the periphery so that the whole of the fundus shows generalized choroidal sclerosis with its characteristic appearance.

5. Absorption of the exposed sclerosed choroidal vessels, giving an appearance reminiscent of choroideremia.

The findings indicate that the affection is inherited in a dominant manner.

—*Ray Karchmer Daily, M.D.*

NOSE AND SINUSES

Reconstruction of the Amputated Nose; Report on 30 Cases. RALPH BLOCKSMA and CYRIL O. INNIS. *Plastic & Reconstr. Surg.*, 1955, 15: 390.

THE AUTHORS describe techniques they have used in the plastic repair of 30 cases of nose amputation. The injury, encountered in parts of Pakistan, is one of several still inflicted as punishment upon women suspected of infidelity; quarrels between men in these areas may be settled by similar mutilation.

The techniques used fall into four categories; (1) forehead flaps, (2) arm tubes, (3) distant tissue transfer, and (4) local tissue transfer.

The forehead flap was the method most commonly used in these cases and proved to be the most suitable; it allowed the reconstruction to be carried out relatively quickly and the final skin color match was usually good. Arm tubes and tissue transfers frequently developed an excess of pigment and marred the appearance of the end result.

—*John R. Lindsay, M.D.*

Secondary Rhinoplasties: Their Cause and Prevention. GERALD BROWN O'CONNOR and MAR W. MCGREGOR. *Plastic & Reconstr. Surg.*, 1955, 15: 404.

THE AUTHORS discuss some of the problems they have encountered following primary rhinoplasties. Postoperative complications requiring further surgery included skin necrosis and hematoma formation, curling of cartilage implants and side-slipping of cartilage grafts inserted at the nasal tip, cartilage graft infections, intranasal incisional contractures, drooping and deviation of the tip of the nose, and broadening of the

base of this organ. These complications are examined in detail, and their probable causes and the measures designed to lessen their incidence are discussed.

—John R. Lindsay, M.D.

Present State of the Surgical Treatment of Chronic Frontal Sinusitis. ANTONIO RAUL BERGARA and ANIBAL O. ITOIZ. *Arch. Otolar.*, Chic., 1955, 61: 616.

THE MOST IMPORTANT REASON for chronicity in frontal sinus disease is retention. When this is caused by extrasinus pathology it frequently yields readily to an intranasal surgical approach. Causes of this nature include deviation of the nasal septum, hypertrophy of the middle turbinate, nasal polyposis, and constriction of the nasofrontal duct.

Causes of chronicity also are found within the frontal sinus, but these cases are more difficult to treat. Large sinuses frequently show deep diverticula, partial partition, and retention cells, and these factors favor retention with the added complication that chemotherapy and antibiotics have little effect.

In the surgical treatment of chronic frontal sinusitis the authors believe the first attempt should be an endonasal effort to secure good drainage. The second attempt is really two operations performed successively: first, a transmaxillary ethmoidectomy according to the Ermiro de Lima technique, and then at once, the operation on the frontal sinus. They believe that in order to obtain adequate exposure it is necessary to mobilize the anterior wall of the frontal sinus with an osteoperiosteal flap and then to obliterate the sinus cavity with an autograft of fatty tissue taken from the anterior abdominal wall.

Local and regional anesthesia is necessary.

The incision of the skin is made in the eyebrow and undermined superiorly. After elevation of the periosteum the first trephine hole is made 3 to 4 mm. above the frontomaxillary suture for exposure.

Through the trephine just made a curved probe is used to explore the limits of the sinus and additional trephine holes are made as near as possible to the periphery of the sinus but avoiding the orbital rim. Then a linear burr is used to link the perforations. The orbital rim is very fragile so that by applying two flat instruments through the osseous incision it is easily fractured and forms the hinge of the flap.

The mucous membrane is entirely removed and the anterior ethmoid cells are resected. The "agger-nasi" cells and cells surrounding the nasofrontal duct are removed.

Since, July, 1949, the authors have not provided drainage from the sinus into the nasal fossa. It is not needed because the sinus is filled with fatty tissue taken from the abdominal wall of the patient. The tissue is cut into small pieces, but one of them should be large enough so that it can be fitted with a little pressure into the upper end of the widened nasofrontal canal, with care that it does not slip into the nasal fossa. Smaller pieces are carefully adapted to the periphery of the sinus, and with the others the rest of the cavity will be filled, but the last pieces should be inserted loosely, without pressure.

If the procedure of taking fat from the abdominal wall of the patient is to be avoided, fatty tissue obtained from a fatty tissue bank can be used. This bank is filled with material obtained in operating on a fatty tissue apron, which is later cut into pieces of about 4 by 4 by 4 cm., then washed and put into wide-mouthed bottles containing isotonic sodium chloride solution. These should then be placed in the autoclave for 5 minutes, after which they may be kept at room temperature until needed. Finally, the osteoperiosteal flap is returned to its original position and sutured.

The authors discuss other methods of obliterating a sinus, and describe several experiments illustrating the superiority of the use of free grafts of fatty tissue. They believe adipose tissue which has been boiled 5 minutes is superior to that which has not been so treated since it has suffered an osteofibrous transformation. Recently they have used with success a mixed implant formed by adipose tissue sterilized in the autoclave and a blood clot. From their observation the graft of adipose tissue was vital despite its being transplanted to a septic cavity and it resisted infection the same as any other connective tissue; with appropriate medical treatment it tended to become organized and not to be eliminated.

John J. Ballenger, M.D.

MOUTH

Extent of Mandibular Resection Required for Treatment of Oral Cancer. LOUIS T. BYARS. *Arch. Surg.*, 1955, 70: 914.

THE MANDIBLE becomes the host of a malignant tumor by one of five methods. It is rarely the site of a metastasis or of a primary growth. Most frequently an advancing primary lesion of oral mucosa penetrates its integument, involves the upper surface, and enters the bone. Invasive cancer of the lip may spread to the region of the mental foramen, enter, and travel up the core of the mandible. This route is also followed by lesions of the oral mucosa in the cuspid region. Cancer of the lip and sometimes that of the face and cheek metastasizes to the "buccal" lymph node. This is a node in the cheek-neck position occurring at the point where the facial artery crosses the lower border of the mandible. Such a node is separated from the bone by a bit of areolar tissue, quickly becomes parasitic upon the mandible, and invades it by direct encroachment.

When the mandible is involved, the surgeon may select one of three procedures. The simplest operation is the resection of the cancer along with the periosteum and a plate of underlying bone, not interrupting the continuity of the mandible. This conservative approach must, of course, be reserved for the lesions of minimal extent.

More frequently a radical resection is necessary. A full-thickness segment may be excised, or the mandible may be resected and disarticulated. The simple segmental resection is quicker and easier to perform; it is followed by a smoother postoperative recovery, causes less deformity, and lends itself to secondary repair if such is indicated. It may also be an inadequate procedure under certain conditions.

The basic consideration in choosing the type of treatment depends upon whether or not the inferior dental canal with its vessels, nerves, and lymphatics has been entered by cancer cells. It forms a natural

FIG. 1 (Lynch).—Diagrammatic sketch showing line of incision (modified Moore). Dotted lines above show extent to which incision may be carried. Lower dotted line shows incision beneath lip.

path for cancer dissemination and, if invaded, any operation other than adequate jaw resection with disarticulation at the temperomandibular point is likely to leave behind a segment of mandible with cancer cells growing in its core.

The author points out the difference between the healthy, fully developed adult mandible and the edentulous atrophic one. In the latter the alveolar process may be completely absorbed so that the mandibular canal lies only a millimeter or so from the upper cortical border, thus rendering it easily susceptible to surface erosion by malignant tissue.

To provide an adequate incision for the operative procedure the author always makes his incision from the lip border to the transverse arm of the neck dissection incision. All operations which require a full-thickness removal of the mandibular bone are performed with neck dissection in continuity. Great care is exercised to prevent seeding of the malignant cells. If pharyngeal collapse can safely be prevented tracheostomy is obviated.

The mandible is supported by Kirschner wires of various shapes or other suitable material. No effort is made to shape the bar to conform to the normal curvatures of the mandible. Rather, the prosthesis follows the straightest line between two points and is so placed that it will lie between inner and outer soft tissue coverings. As secure a closure of intraoral tissue is made as possible.

In most instances the prosthesis is a temporary splint which is removed in 2 to 6 weeks. In some cases it becomes permanent. —*John J. Ballenger, M.D.*

Malignant Tumors of the Superior Maxilla. MERCER G. LYNCH. *South. M. J.*, 1955, 48: 569.

TUMORS OF THE SUPERIOR MAXILLA account for only 2 per cent of malignant growths in general. Of these 80 to 85 per cent involve the antrum. The author is concerned with malignant tumors of the superior maxilla, especially the antrum.

Symptoms of a neoplastic growth in the maxillary sinus usually are late in appearance. Those that originate on the floor of the sinus frequently cause pain in the teeth rather early so that an earlier diagnosis is made and the prognosis is improved. Other symptoms include swelling, nasal blockage, nasal discharge, epistaxis, and lacrimation.

Metastatic extension from the floor of the sinus occurs first, usually in the submaxillary and carotid nodes which are surgically accessible. Tumors from the upper part of the sinus usually metastasize earlier than those of the floor of the sinus, with involvement of the retropharyngeal nodes and may go on to extension in the orbit and the ethmoid bone.

The author believes operation through an untouched field (where the limits of the malignant lesion can be more adequately determined), followed by extensive thorough radiation, would seem to be the treatment of choice in neoplastic growths of the superior maxilla. Tumors should be considered inoperable if they already have reached the base of the skull or nasopharynx or if there is distant metastasis or even extension to the opposite side. From 2 to 30 per cent of the cases fall into this category.

If the surgical approach is decided upon the author employs the modified Moore incision (Fig. 1) followed by resection of the superior maxilla. Exenteration of the ethmoid and frontal bones and the orbit is done when necessary. Prior to the surgical procedure it is advisable to ligate the homolateral external carotid artery. The author is not in favor of skin grafting the cavity because it might conceal evidence of an early recurrence.

Postoperatively the wound cavity is packed with petrolatum and tincture of benzoin packs for about 10 days. As soon as the packs have been removed a mold of dental compound is inserted into the defect, and is kept in place at all times except for irrigating or when roentgen therapy is being administered. Irradiation is begun as soon as the cutaneous incision has healed and all sutures and packing are removed, which usually is about the tenth post-operative day. A month or 6 weeks after the roentgen therapy has been completed a permanent prosthesis may be fitted.

—*John J. Ballenger, M.D.*

A Compound Neck Pedicle Designed for the Repair of Massive Facial Defects: Formation, Development, and Application. NEAL OWENS. *Plastic & Reconstr. Surg.*, 1955, 15: 369.

RECONSTRUCTION of massive defects of the face is not only difficult but also presents unusual problems because of the numerous requirements which must be fulfilled. The common sites for obtaining tissues, all with objections, are the abdominal wall, chest, axilla, back, and thigh. The author has developed a method for correcting these massive defects of the face. It entails the use of a neck flap which offers a

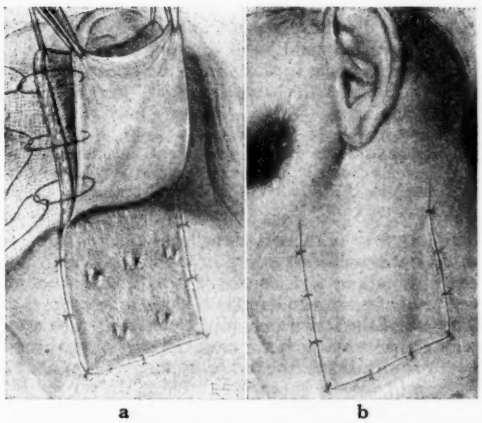
massive amount of tissue from the standpoint of surface area and fulfills all color and texture requirements.

The pedicle is different than an ordinary one in that it is much thicker and offers more surface area. It is fashioned from the tissues lateral to the midline of the neck (Figs. 1a & b) and usually is roughly rectangular in outline. The superior border of the pedicle should be left intact as its base. To form the pedicle, incisions are carried down through the full thickness of the skin, the underlying fat, the platysma muscle, the cervical fascia, and down to and including the sternocleidomastoid muscle. The size of this compound pedicle varies with the requirements of the defect to be filled. After the face is dissected and the pedicle is delivered a split thickness graft is immediately applied to the defect by raising the flap and also the undersurface of the pedicle. The pedicle is then shifted forward and upward in the first step toward its ultimate bed. For an adequate description of the several stages of placing the pedicle the reader is referred to the original article.

After reconstruction of a massive defect, the author frequently finds it necessary to implant either bone or cartilage in order to build or maintain contour. This is done easily because of the abundance of the blood supply in this type of pedicle.

The author has used his technique for more than 8 years with satisfactory results.

—John J. Ballenger, M.D.



a b

Fig. 1 (Owens). a, A thick split skin graft (full size of Reese dermatome) has been removed and attached to the borders of the defect created by dissecting this compound pedicle. It continues up in contact with the under surface of the compound pedicle to form its lining. The skin graft is in contact with the carotid sheath beneath area outlined by mattress sutures. b, Subsequent to application of thick skin graft to under surface of the compound pedicle and the defect formed by dissecting the compound pedicle, the pedicle is replaced into its original position and held fixed by means of a few interrupted sutures.

NECK

The Treatment of Thyrotoxicosis with Radioiodine. Kent F. Balls, Richard H. Chamberlain, Edward Rose, Robert O. Gorson, and Henry C. Blount, Jr. *Radiology*, 1955, 64: 858.

The authors report their results in the treatment of 180 thyrotoxic patients with radioiodine. These patients had been followed for intervals ranging from 1 year to 5 years. In patients below the age of 40, radioiodine (I^{131}) was not used unless a previous thyroidectomy had been performed or other unusual circumstances were present.

The I^{131} used was obtained from Oak Ridge National Laboratories in the form of carrier-free Na_1 in basic Na_2SO_3, and was given orally. Uptake measurements for both tracer doses and treatment doses were made 24 and 48 hours after administration. The authors were not satisfied with the various mathematical formulas used to compute the dosage of radioactive iodine to be given, and based their dosage on a rough estimation of the size of the gland, and the clinical and tracer evidence of the severity of the thyrotoxicosis.

Relief of thyrotoxicosis occurred after a single treatment in about 80 per cent of the patients and after one or more treatments in 97.2 per cent. Relief was obtained by all 42 patients who had postoperative recurrences and in all of 15 patients who had nodular goiters. The incidence of protracted posttherapeutic hypothyroidism was 18.3 per cent.

There was one death in the group, which occurred in a young woman (from a thyroid storm), representing a mortality rate of 0.6 per cent.

There was poor correlation between the therapeutic results and the administered doses in millicuries and the calculated dose in rads.

—Ely Elliott Lazarus, M.D.

Malignant Tumors of the Thyroid Gland; Therapeutic Results (Les tumeurs malignes de la glande thyroïde; résultats thérapeutiques). Pierre Dor. *Acta chir. belg.*, 1955, 54: 180.

This article is based on the study of 90 cases of malignant thyroid tumors.

The average age of this series of patients was 57.5 years, which is high for malignant thyroid lesions, but is explained by the fact that 2 patients less than 20 years old were not included.

Seventy-three per cent of the patients presented clinical signs of cancer at the time of treatment. The existence of a thyroid tumor was noted by 77 of the patients, with an average delay of 8 years before treatment was sought. In 59 per cent of the cases the rapid growth of the tumor brought the patient to consultation.

The author reported 23 per cent "cures" (sic) and 5 per cent of 5 year survivals with recurrence, totaling 28 per cent of 5 year survivals.

Surgery in malignant thyroid tumors should not be limited to mere excision of the tumor. A radical thyroidectomy should be planned and followed by intensive irradiation.

In the so-called "inoperable" cases radiotherapy does not offer a cure and therefore surgery is advised to relieve pressure symptoms and to increase the ef-

ficiency of the irradiation. This procedure is followed even when distant metastases exist.

There was no mention of adjacent block dissection of the lymph nodes in addition to the radical thyroidectomy. Perhaps the word "exeresis" in the original article implied it. —*Andrew Z. Speare, M.D.*

An Evaluation of Neck Dissection Associated with Other Radical Procedures for the Treatment of Cancer in the Head and Neck. MURRAY M. COPELAND. *Ann. Surg.*, 1955, 141: 910.

THE MAJORITY of cancers of the head and neck spread to, and are confined in, lymph nodes above the clavicles until late in their courses. Tumors which tend to venous metastasis are lymphoepitheliomas, cancers of the base of the tongue, thyroid cancers, and melanomas. The lesions which spread to the lymph nodes tend to keep to the side of the tumor, to spread to both sides if the primary site is near the midline, and to spread to the opposite side if the homolateral nodes are blocked by the disease, by radiation fibrosis, or by surgical excision. Knowledge of the pathways of drainage from tumors to the deep cervical nodes, directly or through sites of superficial nodes, provides the anatomic basis for suitable excisions.

When the neck dissection does not include the lymphatics between the primary lesion and the nodes, or when it is done after the treatment of the primary lesion has been completed, it is said to be a dissection in discontinuity. The author agrees with the surgeons who do not recommend prophylactic dissections in discontinuity, and who feel that the ultimate prognosis does not deteriorate if metastatic nodes are removed after they become palpable. When that occurs, only evidence of distant metastasis or advanced local growth deters him from dissection in suitable risk patients.

On the other hand, there is increasing enthusiasm for dissections in continuity, wherein the primary intraoral, pharyngeal, laryngeal, or salivary gland neoplasms are removed in a block of tissue which includes the cervical lymph nodes and the connecting lymphatics. Segments of mandible may be included, or the jaw may be divided to provide exposure, then be replaced.

The techniques of the dissections with and without mandibular section are described in detail and profusely illustrated. The interested reader will profit from examining them closely.

Varying characteristics of the neoplasms suggest different plans of treatment. Of the skin lesions, melanomas should be treated with neck dissection in continuity when feasible. If not, the dissection in discontinuity should be deferred for about 2 weeks to allow the tumor cells in the lymphatics to be filtered by the nodes.

Prophylactic dissections are not recommended for lip cancers. There is strong argument concerning the advisability of prophylactic neck dissections in tongue cancer patients. Although the majority of metastases are homolateral, there seems to be about as much chance (20%) of contralateral or bilateral metastases as there is of finding unsuspected metastases during prophylatic dissections. Dissections in continuity are recommended for most cases of floor of the mouth cancer. This type of operation for tonsillar lesions has as yet undetermined value. Radical excisions of the primary lesions with prophylactic in continuity dissections offer the best means to cure salivary gland carcinomas. The role of node dissection along with thyroidectomy for unilateral or bilateral cancer will vary with the cytology of the lesion and its extent. For papillary adenocarcinomas with palpably enlarged neighboring nodes, the author recommends radical dissection of the nodes of one or both sides of the neck (in two stages if the latter).

—*Leonard D. Rosenman, M.D.*

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Cranial Bruit—Its Significance. JAMES L. POPPEN. *Surg. Clin. N. America*, 1955, 35: 881.

THERE ARE various conditions which may cause a bruit: arteriovenous fistula, vascular malformation, brain tumor compressing a large artery, hemangioblastomatous meningiomas, intrinsic or intracranial arterial changes such as arteriosclerotic plaques, aneurysm which has ruptured into a venous sinus, glomus jugularis, and carotid body tumors. Sometimes murmurs may be transmitted to the larger vessels of the head through the carotid system in hypertensive arteriosclerotic patients, or because of coarctation of the aorta, highly vascular thyroid glands, scalp angiomas, traumatic arteriovenous fistulas, or Paget's disease.

Other types of noises may be perceived by the patient in cases of aeroceles, of sinusitis when both air and fluid are present, of fluid in the external auditory canal, or inflammatory changes in the eustachian tube. Cranial bruit may be subjective, objective, or both. However, it is always synchronous with the heart beat. Occlusion of either carotid artery in the neck by digital compression may obliterate the noise or alter its character. The head of a patient complaining of a noise should be auscultated in various positions as oftentimes the position may alter the bruit. The character of the bruit may change during respiration or occlusion of one or the other carotid artery. The normal blood flow does not give rise to a bruit. A small murmur is often heard over a wide area but is most intense directly over the vascular malformation or a fistula. Arteriography is often helpful in localizing the pathologic process.

—*George Perret, M.D.*

Some Differential Features Concerned with Space-Consuming Intracranial Lesions in the Elderly. GILBERT HORRAX and GERALD R. NOWLIS. *Surg. Clin. N. America*, 1955, 35: 873.

THE AUTHORS discuss the differential features in the diagnosis of cerebral lesions in the elderly, with special emphasis on subdural hematoma and primary and metastatic brain tumors, and their relation to the large group of cerebrovascular disorders.

The absence of a history of trauma should never mislead one into excluding the possibility of a subdural hematoma. Oftentimes psychiatric symptoms may be the only manifestation of subdural hemorrhage.

There is but one sure way to exclude the presence of a subdural clot—the drilling of bilateral burr holes. Negative explorations should not deter one from continuing to make burr holes whenever there is a reasonable doubt, especially if the history and the symptoms are not clear-cut and if the spinal fluid is under normal pressure. In older persons the diagnosis of cerebrovascular disease, though common, is justified only after careful study has ruled out a lesion which may be capable of surgical cure or amelioration. Careful neurologic examinations should be repeated and carefully evaluated. Cerebral thrombosis has usually a sudden onset with maximal symptoms and physical signs following immediately or soon thereafter. The anticipated course is one of improvement or at least maintenance of the status quo. Cerebral hemorrhage is also acute in its onset and is usually followed by death.

Bleeding into a cerebral neoplasm can simulate thrombosis or hemorrhage. However, in brain tumor and chronic subdural hematoma the illness gradually progresses and the history of the preictal period usually gives some hint of a disability suggesting gradual expansion of a space-occupying lesion. A high spinal fluid pressure is suggestive of a space-taking lesion, especially if it is accompanied by a high protein level. Roentgenograms of the skull give useful information, especially if erosion, hyperostosis, calcification, or fracture lines are present. A shift of the calcified pineal body may help lateralize the lesion.

The authors believe that, whether the patient is young or old, a radical extirpation of all brain tumors is a proper form of treatment whenever this will not leave the patient more incapacitated than before operation. They also recommend intervention in metastatic tumors when there is evidence of a single focus. When multiple foci are apparent a surgical approach is only rarely indicated. —*George Perret, M.D.*

Recent Trends in the Management of Craniocerebral Injuries; a Plea for Prevention of Deaths from Reversible Injuries to the Brain. EMIL SELETZ. *J. Am. M. Ass.*, 1955, 158: 535.

THIS EXCELLENT PAPER, if read and remembered by the readers of the Journal of the American Medical Association, should be of value in preventing death from reversible injuries to the brain. The author stresses several points which are well known to the neurological surgeon but not so well known to those not trained in this field, namely, that the injury to the brain is of paramount importance while the injury to the scalp or skull is of little import by itself.

The author believes that mismanagement of brain injuries may be due largely to standardized misconceptions that are copied from one textbook to another. He states that there is considerable variation in the development of surgical hematomas of the brain and that one should be aware of these. The most important single symptom of progressive intracranial bleeding is a deepening coma and it is believed that every patient with a history of a head injury, who, several hours later, goes into a coma from which he cannot be aroused surely has intracranial bleeding. However, one should also be aware of injuries elsewhere. Rupture of the spleen is not infrequently an associated finding with a head injury.

The author makes a plea that the patient with a head injury who is not doing well deserves the specialized attention of one experienced in dealing with

these lesions, much as a patient with an acute abdominal condition is in need of a general surgeon whose special skills in palpation may be of great diagnostic value. He discusses briefly the treatment of these various lesions, but throughout the paper he stresses the great importance of their recognition and early treatment. —*Nicholas Wetzel, M.D.*

Anticholinergic Therapy in Closed Craniocerebral Trauma (Zur Frage der anticholinergen Therapie bei geschlossenem Schaedel-Hirntrauma. F. L. JENKNER and H. LECHNER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 361.

OF 308 PATIENTS with craniocerebral trauma, 249 were treated by the administration of anticholinergic substances, while the remainder were either not treated or treated by conventional dehydration methods. A comparison of the clinical improvement and of electroencephalographic tracings for the three groups of patients was made.

For all three groups it was noted that clinical improvement preceded the return of the electroencephalograms to normal. In the group of patients treated with anticholinergic substances both clinical improvement and electroencephalographic normalization proceeded at a significantly more rapid rate than in the other two groups. The authors conclude that anticholinergic therapy is preferable to conventional hypertonic therapy for closed craniocerebral injury. —*John L. Lindquist, M.D.*

The Treatment of Athetosis by Destroying the Ansa Lenticularis (Essai de traitement de l'athétose par destruction de l'anse lenticulaire). M. R. KLEIN. *Sem. hôp. Paris*, 1955, 31: 1832.

THE AUTHOR has for several years destroyed the ansa lenticularis for athetotic movements. He has tried the technique employed by Guiot which consists of electrocoagulation, using as reference points the olfactory nerves and optic pathways. However, because of the variability of these co-ordinates, errors in the placement of the coagulation resulted. The author found that the mammillary bodies as defined and measured from the pneumoencephalogram were remarkably constant in position, and he used these landmarks for co-ordinates. Through a burr hole in the frontal area and using the instrument designed by Baudoin and Rémond, with certain modifications, he coagulated the ansa lenticularis. However, because of the variables such as current strength and tissue resistance the size of the coagulation could not be predicted. The author devised a small knife which is attached to the needle guide of the instrument used, and the coagulation is done by the introduction of this small knife rather than by usual electrocoagulation.

The operation is done bilaterally and the postoperative complications reported by Fénelon and Guiot were not observed. It is stated that the results obtained are encouraging. The patients are definitely benefited but not cured of their abnormal movements. The need for physiotherapy postoperatively is stressed. The entire ansa lenticularis should be destroyed to obtain improvement. Four figures demonstrate the method of obtaining the co-ordinates of the mammillary bodies. —*Arthur F. Battista, M.D.*

Neurosurgery of the Ansa Lenticularis for Abnormal Movements and in Parkinsonism; Review of the Principles and Methods of a Personal Technique (La neuro-chirurgie de l'anse lenticulaire dans les dyskinésies et la maladie de Parkinson. Rappel des principes et des techniques d'une intervention personnelle). FRANÇOIS FÉNELON. *Sem. hôp. Paris*, 1955, 31: 1835.

SINCE 1950 the author has been interested in the neurosurgical treatment of abnormal movements, especially in the parkinsonian syndrome. He discusses the anatomic, pathologic, and physiologic findings which have convinced him that the neurosurgical procedure should be carried out on the extrapyramidal system itself, at the level where the tracts are relatively compact (level of the ansa lenticularis).

Because of the amount of brain destruction resulting from the open methods, in particular from the transventricular approach, the author has approached and electrocoagulated this region by means of a simple direct course through a trephine opening in the skull.

After evaluating and trying various methods, he has used his high anterior transfrontal approach. He uses the craniocerebral co-ordinates which were carefully determined and seem to be the simplest and most accurate. References to previous publications are given at the end of the article for the details of this technique.

For the past 5 years, the author has used this technique in 61 operations for abnormal movements and particularly in the parkinsonian syndrome. In 70 per cent of these cases he has obtained satisfactory results which have persisted. —*Arthur F. Battista, M.D.*

Modern Measures of Investigation in the Diagnosis of Intracranial Neoplasms; Clinical Material of the Neurologic Division of the Maggiore Hospital of Vercelli, and Practical Considerations (Sui moderni mezzi de indagine nella diagnostica delle neoplasie endocraniche; casistica clinica della Divisione Neurologica dell'Ospedale Maggiore di Vercelli e considerazioni pratiche). FRANCO GRANONE. *Minerva med.*, Tor., 1955, 46: 1331.

SIXTEEN INSTANCES of intracranial neoplasm, or suspicion thereof, are reported. The Neurologic division of the Maggiore Hospital was established 3 years ago; the hospital itself has been in existence for 800 years, being originally a hospice for rest and care of sick pilgrims coming over the passes of the Alps into northern Italy.

There are two purposes of this study; the first is to appraise the value of the various neurodiagnostic modalities used at the hospital for diagnosis, and the second is to discuss the need for establishing a division of neurologic surgery in the projected new hospital. At present the patients for such surgery are being sent to the city of Torino.

The immense amount of clinical, neuroroentgenologic (arterial angiography, pneumoencephalographic) and electroencephalographic findings cannot be here included; only general considerations from perusal of the data given in the original text can be considered.

Neuroroentgenography is a potent weapon in the struggle against cancer in general and in the early

diagnosis of intracranial neoplasms in general. Practically the only instances in which valuable information is not obtained by this modus are those in which the patient's consent cannot be obtained (these methods in general are of considerable discomfort to the patient), or in which the general condition of the patient will not permit of their application.

Electroencephalography in the diagnosis of intracranial neoplasms is not as precise and decisive as is the method of angiography. Of the 16 cases here reported, only 8 furnished probative data, while uncertain data were obtained in 3; in 5 instances the findings with electroencephalography were completely negative. The supplementary expedients of hyperpnea and of sleep were of some help in activating the electroencephalographic tracing; in this respect the method of photostimulation produced no results whatever.

With reference to the question of establishing a division of neurosurgery, the author advises in the negative. Such a department demands skillful and patient neurologists, willing to spend many hours at the bedside of the individual patient, and he doubts that a sufficient number of such persons can be attracted to a small provincial town such as Vercelli, to adequately staff such a section in the new hospital. This restriction, of course, applies only to the tumor aspect of the problem. The author is in favor of establishing a center for neurosurgery in Vercelli for the purpose of collaborating with the department of traumatology, and this center should be equipped with a laboratory for electroencephalography and electrocorticography. The present hospital in Vercelli is one of the few civil hospitals in Italy with a neurologic division of 30 beds and complete and modern electroencephalographic and neuroroentgenologic equipment. —*John W. Brennan, M.D.*

Roentgenologic Diagnosis of Intracerebral Metastases (Zur Roentgendiagnostik intrazerebraler Metastasen). W. Schiefer, Fj. Rausch, and G. Udvarhelyi. *Fortsch. Roentgenstrahl.*, 1955, 82: 656.

Forty-two intracerebral metastatic processes were examined by simple roentgenography and by serial angiography, that is, the contrast medium perabrodil was injected into the carotid artery and a series of exposures were made in the brief period while the contrast material was passing from the arterial into the venous intracranial vessels. In 15 of the patients the intracerebral metastases could be extirpated. In 5 instances test puncture confirmed the roentgenologic findings; in 6 instances the findings were confirmed at autopsy. In 16 instances the diagnosis was regarded as confirmed by the clinical and roentgenologic findings combined with the serial angiographic findings.

The 11 roentgenographic reproductions should be studied in the original article.

In three-fourths of these 42 cases the intracerebral metastasis comprised the first indication of the presence of the parent tumor. From this statistical finding the authors conclude that in every instance of brain tumor a thorough general study of the patient should be made, using every roentgenological recourse in addition to the clinical. Small bronchial carcinomas (up to the size of a cherry) may escape roentgenological demonstration.

In 40 per cent of the cases roentgenographic and serial angiographic depiction of the intracranial vessels permitted the demonstration of a specific tumor type of circulation (sinusal blood collections) in addition to the local diagnosis of an intracranial compressive process. In part these findings resembled those seen in the meningiomas, that is, a homogeneous, rather sharply outlined increased shadow density, corresponding to the capillary phase of the angiographic process, and in part they resembled those of the glioblastoma, that is, the depiction of coarse, irregularly arranged vessels with arteriovenous fistulas, and small sinusal blood collections. To these the authors add a third finding, that is, a form with a fine vascular network of irregularly distributed and formed vessels, similar to those of the so-called glioblastoma group 2, which has been previously described by them (*Acta neurochir.*, 1954, 4: 76).

In the observation of the shadow material through the homogeneous, or capillary phase, of the angiographic process, the angiogram in the series is superior to the simple exposure of the arteriographic method.

Aside from the more or less purely clinical findings and multiplicity of foci, there seems to be no sure means of actually distinguishing between the metastases and the similarly appearing tumors (meningiomas, glioblastomas), and no relationship could be determined between the type of metastatic angiographic findings and the type of the parent tumor. In fact, the meningioma type and the glioblastoma type of shadows are at times found side by side in the same patient. It is possible, indeed, that the type of angiographic shadow may result from local conditions in the tissues in which the metastatic nodule has taken up its residence. —*John W. Brennan, M.D.*

Meningiomas: an Ophthalmic Problem; Diagnosis and Results of Treatment. Henry L. Birge. *Am. J. Ophth.*, 1955, 39: 828.

The author reports a series of 4 cases in which the presenting complaints were of visual difficulty, and in which meningiomas were found in the anterior cranial fossa. There was usually considerable difficulty in making the diagnosis preoperatively. The most consistent changes in the physical findings and laboratory studies were to be found in a careful study of the visual field. From the author's experience and a review of the literature, he believes that these meningiomas are often confused with other conditions and that the early diagnosis is thereby delayed.

There are usually few signs or symptoms of intracranial tumor; whenever symptoms are present, and whatever they may be they usually suggest disease other than that of meningioma. The tumors are usually very large when found at surgery, and therefore they are usually of slow progression, having been present for long periods of time before surgery. It is not unusual for the patient to have had repeated negative studies—x-ray, electroencephalographic and otherwise. The visual defect most usually found was of a homonymous hemianopsia rather than the usual bitemporal or chiasmal defect. Less than 10 per cent of

the patients studied were cured with a 20/20 vision in each eye.

In conclusion, the author states that the early diagnosis of meningiomas in this region depends upon careful repeated studies of the visual field and an insistence on the part of the ophthalmologist that abnormal findings be fully investigated by the neurological surgeon. It is believed that this is the only way in which earlier diagnosis and better results may be obtained. —*Nicholas Wetzel, M.D.*

SPINAL CORD AND ITS COVERINGS

On the Number of Branches Formed by Regenerating Nerve Fibers. GERARD D. H. SHAWE. *Brit. J. Surg.*, 1955, 42: 474.

THIS STUDY was undertaken to determine the total number of axones formed by all fibers, both medullated and otherwise, at different levels from a lesion at various stages of regeneration of both motor and sensory nerves following 3 different types of injury: simple crush, severance of the nerve with immediate suture, and crushing of the nerve proximally and isolating it from the muscle distally.

For the purposes of this investigation the gastrocnemius and sural nerves of rabbits were used. It was found that on the average each axone central to a crushed point in a motor nerve produced three branches in about 20 days, the branching beginning about 6 mm. above the injury. Below the crush the number of fibers reached their maximum number at about 50 days. By 100 days many of the branches disappeared and presumably degenerated, but the fiber content of the nerve was then about 50 per cent higher than in the normal and remained so throughout the period of study of 225 days.

Myelinization began at about 10 days and lasted about 40 days when the number of myelinated fibers reached their peak. About half the axones formed during the early stages never became myelinated, and disappeared. The ratio of myelinated to nonmyelinated fibers was 1 to 0.3. More branching occurred in nerves that had been severed and sutured than in those which were crushed. On the average, each original axone formed as many as four or five branches. The fibers of a motor nerve gave rise to more branches than those of a sensory nerve to the skin during regeneration and some evidence was thought to have been obtained that this was because muscle nerve fibers are larger.

The author thinks that the knowledge of the full extent to which normal fiber population of a nerve is increased during regeneration would be of great significance and would lead to a more accurate assessment of the chances of adequate reinnervation of the nerve part distal to that damaged by various types of injury. —*Nicholas Wetzel, M.D.*

The Clinical Manifestations of Spondylochondrosis (Spondylosis) of the Cervical Spine. JAMES G. ARNOLD, JR. *Ann. Surg.*, 1955, 141: 872.

THE PRESENT ARTICLE is based upon 10 cases of cervical spondylochondrosis. The author makes a distinction between herniation of the nucleus pulposus of an intervertebral disc in the cervical region from that of cervical disc protrusion in the cervical spondylosis, and he believes that the term "spondylochondrosis" preferable in that it takes into account both the cartilage and its protrusion as well as the osteophytic overgrowth of the vertebrae. In 7 of the cases the long tracts of the spinal cord were primarily involved, with resulting paraplegia; in 2 cases the anterior roots only were involved; and in 1 case there was involvement of both the long tracts and the anterior roots.

The author stresses that this disease entity may be misdiagnosed as amyotrophic lateral sclerosis, primary lateral sclerosis, multiple sclerosis, and subacute combined degeneration, and that the reverse also may be true. The importance of posterior bony changes in the cervical spine is stressed as well as the importance of using myelography to make the diagnosis.

An excellent review is given of the anatomy of the region, as well as considerable heretofore unpublished work of Padgett who studied a total of 100 cervical spines to determine the frequency of osteophytosis and the typical conformation of the spinal canal and intervertebral foramina. The size of the cervical spinal canal seems to be unquestionably a significant factor in the cause of the symptoms of this disease. The relationship between the cord, the roots, and the dentate ligaments is also stressed, and the author considers that cutting the latter is of great importance in the treatment of this disease entity. He does not believe that the removal of ridges is of value insofar as adequate removal is impossible without great hazard to the patient. Laminectomy including section of the dentate ligaments without removal of the bony ridges is probably the most satisfactory form of treatment. He does not believe that conservative treatment is of value except in minimal or nonprogressive cases. He obtained excellent operative results in 4 cases, moderately good results in 3 cases, slight improvement in 1 case, no improvement in 1 case, and worsening in another. —*Nicholas Wetzel, M.D.*

Congenital Extradural Cyst. W. LUYENDIJK. *Arch. chir. Neerl.*, 1955, 7: 23.

IN A BRIEF REVIEW of the literature, the author notes that spinal extradural cysts may be of parasitic, teratoid, traumatic, or congenital origin, and that thus far reports of only 33 such lesions have appeared as published case histories. The cysts occur most commonly in the midthoracic region. The symptoms may include progressive spinal cord compression, local widening of the vertebral canal and thinning of the pedicles (Elsberg sign), and deformity of the vertebral bodies as a result of the impaired venous drainage caused by the cyst. It is commonly supposed that such cysts arise as a result of herniation of the arachnoid through a congenital dural defect, for there is usually a discrete arachnoidal pedicle to be found. Hyndman, in 1946, expressed the thought that these cysts may arise from misplaced or detached cell rests, and that their development may be similar to that of ganglia in the wrist region or of epithelial inclusion cysts.

The author's patient was a 14 year old female who showed signs of progressive cord compression, no evidence of vertebral degeneration, but definite thinning of the pedicles of the fifth, sixth and seventh thoracic vertebrae. There was complete blockage of the cere-

brospinal fluid at the level of the lesion, with a marked Froin syndrome below that point. Myelography (ethiodan) revealed incomplete filling of a sac-like mass, dorsally and extradurally, at the level of the sixth and seventh thoracic vertebrae. At operation a cyst 6 cm. long was removed; it had a pedicle which, when cut across, allowed the free flow of cerebrospinal fluid from within the meninges; though the cyst contained cerebrospinal fluid and ethiodan, no dripping of fluid occurred from the cyst side of the cut pedicle, and the author postulates that the cyst filled *in situ* due to a valvelike mechanism within the pedicle. Histologically the wall of the cyst revealed a loose meshwork of collagen fibers, coated on the inner surface with endothelial cells. It was deemed to be an arachnoidal cyst, the result of herniation of that membrane through a congenital dural defect. —*John Martin, M.D.*

Malignant Intraosseous Neurinoma of the Neck of the Femur Associated with a Case of Recklinghausen's Disease (Neurinome malin intra-osseux du col fémoral, au cours d'une maladie de von Recklinghausen). R. FONTAINE, P. WARTER, Y. LEGAL, J. N. MULLER, and R. KIENY. *Rev. chir.*, Par., 1955, 73: 278.

BENIGN INTRAOSSEOUS LESIONS have been described in the literature since 1901 as an occasional complication of neurofibromatosis. The authors present a case of primary malignant neurofibroma of intraosseous origin in a man 32 years old. The patient gave a 6 month history of progressive pain in the left knee and in the left hip with gradual impairment of function. Roentgenographs showed an area of destruction in the neck of the left femur. Examination revealed a congenital type of Recklinghausen's disease which had also been observed among many members of the father's family. Pain, muscle atrophy of the left lower extremity, and restriction of articular function were present. It was thought at first that the patient had a metastatic involvement of the femur. Biopsy suggested a fibroplastic sarcoma. X-ray therapy was instituted. However, the destructive process increased and an interilioabdominal disarticulation of the limb had to be performed. Five weeks after the operation the patient was discharged from the hospital. However, roentgenographs of the chest revealed a lesion suggesting metastasis in the left hilus and the patient died 5 months after operation. Careful histologic study of the tumor revealed it to be a malignant intraosseous neurofibroma. —*George Perret, M.D.*

PERIPHERAL NERVES

Malignant Transformation in the Neurofibromatosis of Recklinghausen (La trasformazione maligna nella neurofibromatosi di Recklinghausen). PIERO GOFFRINI. *Gior. ital. chir.*, 1955, 11: 490.

TWO INSTANCES of so-called neurogenic sarcoma are reported. The histologic findings are essentially those noted by Donald V. Trueblood (SURG. GYN. OBST., 1941, 72: 363) and will not be noted here other than to mention the excellent microphotographs in the original text.

The first case reported was that of a 56 year old housewife who had had from infancy numerous pigmented spots and small superficial nodules, some flat and others pedunculated. In the course of years, particularly after the menopause, the spots and nodules increased in number, and some of them in size, the spots tending to become confluent but the condition otherwise producing no symptoms and not in any manner affecting the general health of the patient.

About 3 months before the patient came under observation one of these nodules, located on the right side of the neck, began to increase rapidly in size, causing difficulty and pain on lateral movement of the head. At examination, in addition to the spots and nodules mentioned, a tumor the size of the head of a fetus at term was noted on the right side of the neck. Over this mass the normal-appearing skin was fairly mobile; however, the mass was firmly fixed in the depths. It was not in contact with the mandible anteriorly; the anterior and posterior margins were not clearly delimited. The consistency was of a uniform woody hardness.

At operation the removed tumor was found to be well encapsulated. The histologic picture was that of a fibroma in the process of sarcomatous transformation. Two months later the tumor had recurred. The rounded mass, the size of a man's fist and again well encapsulated, was again removed. This mass was more myxomyomatous in appearance and richer in cells than the first. A year later the condition had again recurred at the same place and was again the size of the head of a fetus at term. Again the recurrent neoplasm was removed. Two months later the tumor had again recurred and the patient died of cachexia.

The second patient was a 24 year old male who had suffered from early infancy of pigmented spots and nodules which gradually increased in number and spread over much of the entire body during the period of puberty. These spots and nodules had never caused any particular disturbance. About 6 weeks before the patient came under observation he suffered a sudden violent pain in the left leg and thigh while on a lengthy walk and had to return by conveyance. Bed rest largely alleviated the pain, which was relatively more severe during the night.

Physical examination disclosed a pale young man with bodily development somewhat inferior to that expected for the age of the patient, and slight facial hirsutism. The rugae of the forehead were somewhat deeper on the right side than on the left; the palpebral fissure on the right was somewhat larger than that on the left. In addition to the spots and nodules mentioned, covering almost the entire body with the exception of the face, there was a walnut-sized tumor in the region of the right popliteal space, it was rather mobile and painful to pressure. In the right interscapular region of the back there was a fist-sized tumor, adherent to the skin and to the deeper tissues, which was painful spontaneously and to pressure.

At operation the tumor of the back region was removed. This tumor also was well encapsulated. Histologic examination of the removed specimen disclosed a polymorphous fibroblastic sarcoma (Figs. 2 and 3). Other lesions removed from this same patient furnished a diagnosis of neurofibromatosis.

The sarcomatous tumor recurred promptly, despite roentgen irradiation, and the new mass was of much

the same character as the original neoplasm. This recurrent mass was removed and, a year later, was again removed. Nevertheless, the patient died of extreme cachexia the following year.

The author is aware of the warning against attempting surgery on these patients, because of the certitude of recurrence and the danger that the operative trauma itself may produce malignant transformation in other lesions at a distance; nevertheless, he believes that with any suspicion of malignant transformation, such as a rapid increase in volume of the neoplasm, surgical removal is amply justified. On the other hand, he considers that the surgeon should exercise extreme caution in attacking the lesion of Recklinghausen's neurofibromatosis surgically for purely esthetic reasons or because of complaints of unbearable disturbances of function.

—*John W. Brennan, M.D.*

SYMPATHETIC NERVES

Experiences with Thoracolumbar Sympathectomy and with Combined Adrenalectomy-Sympathectomy in the Treatment of Patients with Essential Hypertension. H. A. Zintel, A. M. Sellers, C. C. Wolferth, W. A. Jeffers, and Others. *Surgery*, 1955, 37: 928.

A PRELIMINARY REPORT of a comparison between two similar groups of patients with essential hypertension is presented. One of these was a group of 76 patients who were subjected to extensive thoracolumbar sympathectomy with excision of the three splanchnic nerves, the ganglionated sympathetic chain, including the third lumbar ganglia, and the ganglion corresponding to the highest gross origin of the greater splanchnic nerve. The other group comprised 125 patients from whom approximately one inch of the greater and lesser splanchnic nerve was excised and the ganglionated sympathetic chain was excised from the twelfth thoracic to the second lumbar ganglion inclusive. In approximately two-thirds of these patients a small fragment of adrenal gland was left on one side, while in the remainder a bilateral total adrenalectomy was performed.

The patients undergoing the extensive thoracolumbar sympathectomy have been followed up from 3 to 7 years, while those who were subjected to combined adrenalectomy and sympathectomy have been followed up from 0 to 4 years. It was the authors' impression that the combined adrenalectomy and sympathectomy was a less traumatic procedure than thoracolumbar sympathectomy, and a listing of the postoperative complications indicates that some type of postoperative complications or sequelae developed in 82.9 per cent of the patients with thoracolumbar sympathectomy, while in the adrenalectomy-sympathectomy series only 52.4 per cent developed complications. In addition, a shorter period of hospitalization, by several days, was required in the adrenalectomy-sympathectomy group and the patients complained less of persistent backache postoperatively than did the patients subjected to thoracolumbar sympathectomy. A higher incidence of excellent blood pressure responses and a lower incidence of poorer responses or failure were found in the adrenalectomy-sympathectomy series. Further, the postoperative changes in the electrocardiographic tracings and heart size were more satisfactory. However, although the operative morbidity was higher in the thoracolumbar sympathectomy series, the operative mortality was higher in the adrenalectomy-sympathectomy series. Survival rates in the short periods of time available were superior following adrenalectomy-sympathectomy for the groups which Smithwick has classified as two, four and five patients.

—*Nicholas Wetzel, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Eosinophile Granuloma of the Ribs; Review of the Literature and Report of 2 Cases with 4 Year and 6.5 Year Follow-Up, Respectively. JAMES F. O'NEILL, STANLEY J. SKROMAK, and PAUL R. CASEY. *J. Thorac. Surg.*, 1955, 29: 528.

THE LITERATURE contains reports of 189 patients with eosinophile granulomas of bone. This disease is defined as benign, chronic, and progressively destructive, resembling an inflammatory or neoplastic process. The lesion begins in the medullary area of a bone and spreads out causing erosion and perforation of the cortex with replacement by a yellowish or brownish tissue. Under the microscope, sheets of eosinophils and histiocytes first appear. In later stages, eosinophils disappear, fibrosis is increased, and large mononuclears and lipophages undergo vacuolization, after which connective tissue replacement and bone conversion follow. Combination of bone and eosinophile infiltrations of skin or pulmonary tissue are noted but no relationship between these has been demonstrated.

Eosinophile granuloma causes systemic disturbances such as malaise, low grade fever, weight loss, and an eosinophilia varying from 4 to 12 per cent. Biochemical blood studies are usually within normal limits. On roentgenography an eosinophile granuloma appears as an irregularly destructive lesion with a zone of radiolucency with little or no periosteal reaction. Involved in this diagnosis are all the neoplastic and inflammatory diseases of bone. The diagnosis must be made by biopsy or excision of the lesion.

The clinical course of untreated lesions varies from spontaneous healing to local invasion and pathologic fracture. Response to x-ray therapy is uncertain and nonspecific but is of benefit for the relief of pain. The authors have followed up 2 patients who are alive and well 4 and 6.5 years, respectively, after resection of eosinophile granulomas of the ribs.

—*B. G. P. Shafiroff, M.D.*

The Surgical Management of Funnel Chest. P. F. HAUSMANN. *J. Thorac. Surg.*, 1955, 29: 636.

IT HAS BEEN WELL DOCUMENTED that funnel chest can be repaired surgically with excellent results. The authors believe that the major problem is the proper selection of cases.

In infants under 12 years of age, two classifications are made: those without respiratory obstruction and those with respiratory obstruction. In the latter group the respiratory obstruction must be relieved before surgery is undertaken or recurrence is likely. In some of these cases there will be a diminution in the size of the deformity once the respiratory obstruction is corrected.

The presence or degree of paradoxical respiration has been an influencing factor in deciding to operate upon infants. In infants with small defects and no paradox, operation has been withheld. In more than 50 per cent of the infants the defects disappeared. It was found without exception that the greater the degree of paradoxical motion, the more likely the defect was to persist or enlarge. In those cases in which the defect did not enlarge operation was postponed until after the child was a year old. If the defect progressed in size immediate surgery was carried out.

It has been universally true that the paradox continued although it was less marked when the patient was anesthetized and an endotracheal tube had been inserted.

No fixed deformities of the sternum were noted in the patients under 2 years of age other than sharp angulation of the xiphoid process and this was resected in most cases. After this age fixed deformity is the rule.

In this group of patients, 51 were treated surgically and 10 were not considered suitable for surgery at the first examination. There were no operative deaths and only one minor complication.

The majority of patients were operated upon between the twelfth and twenty-fourth months of life as the ideal time. The child withstands anesthesia well and the paradoxical respiration which accompanies the cutting of the costal cartilages and sternum, and fixed deformities have not occurred to necessitate a more extensive procedure.

Forty-nine of the patients were treated by extensive subperichondrial resection of the rib cartilages with removal of all the deformed cartilage. The number removed depended upon the size of the deformity and varied from three to seven cartilages bilaterally. By resecting subpericondrial cartilage, regeneration occurs rapidly and a stable chest wall is evident within 10 days after the operation. The 2 other patients were treated by a simple ligament cutting operation.

The value of subperichondrial resection is twofold: first, regeneration of cartilage occurs rapidly so that a stable chest is present within 10 days of operation; and second, the postoperative shape of the chest can be formed by the careful placing of sutures in the perichondrium, and external fixation of the sternum is not necessary.

Recurrence of funnel chest deformity can be prevented to a great degree by good postoperative physiotherapy. This should include breathing exercises, posture training and shoulder exercises. This may be difficult in the very young but can often be accomplished in the 2 year old. Most of these children are round-shouldered and pot-bellied and this may remain postoperatively and tend to promote recurrence of the deformity if exercises are not carried out.

Hypertrophy of the substernal ligament was noted in 13 of the patients, but only 5 showed evidence of abnormal traction on the lower sternum. Thirty-eight of the patients showed no evidence of abnormal ligamentous pull. The conclusion is that the deformity is primarily due to the overgrowth of cartilage which forces the sternum backward, rather than abnormal ligamentous or muscle pull.

Ten patients were not treated by surgical intervention and their follow-up was as follows: 2 of the patients had severe laryngeal stridor, which when corrected left them with a minimal deformity; 3 patients had a minimal deformity and in none did the condition progress; one patient was believed to be too young for extensive surgery and the defect has regressed to minimal deformity; the remaining 3 patients had associated diseases which required treatment before intervention for the chest deformity and these 3 patients still have the deformity.

—*John H. Davis, M.D.*

Hyperfolliculinia and Cancer; Phenolsteroid Determinations in Cases of Genital and Mammary Cancer (Hyperfolliculinie et cancer; les dosages des phénolstéroïdes au cas de cancers génitaux et mammaires). A. J. Bret, M. Bardiaux, and Molinier. *Rev. fr. gyn. obst.*, 1955, 50: 194.

Following a brief review of the literature concerning the relations between the sex hormones (in particular the estrogens), and the development of cancers of the breast and genitalia, the authors present their study of the relations existing between the folliculinic metabolites (phenolsteroids) and such cancers. The phenolsteroids were determined by the Jayle method, with the specific color reaction devised by Kober in 1930. This test yields information on the metabolites issuing from estradiolestrone and estriol, and also on the x-chromogens, which are without doubt related to the follicular hormone. The tables give the age of the patient, the time of the menopause, the time of taking endocrine vaginal smears to indicate the folliculinic activity on the vagina as a sensitive receptor. Finally, the phenolsteroid excretion in 24 hours is noted, the treatment is administered, and the histologic findings in the specimens from 6 cases of cancer of the breast, 3 cases of cancer of the uterus, and 20 cases of cancer of the cervix are noted. Before any treatment of cancer of the breast, a constant relative frequency of increased excretion of phenolsteroids seems to exist. This is true also in cancers of the uterus even in older patients, and the increased excretion of phenolsteroids is noted with particular frequency in cancers of the cervix. The progressive increase in excretion of phenolsteroids following castration has not been explained but has no relation to revival of the neoplastic growth.

With regard to the relation between hyperfolliculinemia and cancer, it has been demonstrated that endometrial hyperplasia and hyperphenolsteroiduria are frequently associated in the absence of cancer. There is also a syndrome of hyperphenolsteroiduria following castration with symptoms of backache and roentgenologic evidence of osteoporosis. It is suggested that this association of hyperphenolsteroiduria following castration might help to explain the bone metastases in carcinoma of the breast, a parallelism that might be followed up by demonstration of a favorable effect of androgens in bone metastases and in castration osteoporosis. Hyperfolliculinemia *per se* appears to have varied consequences and does not seem sufficient to cause cancer, except perhaps in a patient with predisposed terrain, whether familial or hereditary.

The origin of this hyperphenolsteroiduria and the means of combating it have to be disclosed. Besides the ovary and adrenal cortex other tissues partaking in the secretion of estrogen bodies include the skin, pituitary gland, spleen, lungs, and heart.

Although increased excretion of phenolsteroids is not a constant phenomenon in cancers of the breast and genitals, it is very common. This excretion should be followed in the urine rather than in vaginal smears because the receptivity of the vagina is frequently impaired after the menopause. The increase in phenolsteroiduria following castration would seem to justify treatment directed toward adrenal activity. Removal of the adrenal glands might be reserved for extreme cases with recurrences and metastases, while in earlier cases radiotherapy of these glands under constant biologic control might be recommended as complementary treatment.

—*Edith Schanche Moore*

Simultaneous Occurrence of Cancer and Tuberculosis in the Mammary Gland (Ueber das gemeinsame Vorkommen von Krebs und Tuberkulose in der Brustdruese). H. Trimpe. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 433.

In each of 3 patients the upper outer segment of the left mammary gland was the site of a cancer interspersed with histologically proved predominantly productive, submiliary and miliary tubercles, while the rest of the gland showed no specific granulomas. Simultaneously there was chronic tuberculous involvement of the homolateral cervical and axillary lymph nodes. Anamnesis and histological examination proved conclusively that in each patient the tuberculous lymph node involvement preceded the occurrence of mammary cancer and that the miliary granuloma were of recent retrograde spread via the lymphatics.

Therapy consisted in immediate ablation of the mammary gland with subsequent x-ray irradiation, x-ray castration, and administration of androgenic hormones. Tuberculostatic drugs were used to prevent the spread of tuberculosis.

There was far-reaching similarity in the course of the illness of each patient, but no conclusive evidence that the course of either disease influenced the other. The genetic relationship has been discussed in the literature where the connection between chronic tuberculous cavities and cancer in the tuberculous scars has long been pointed out. However, it is diffificult to assess the specific role of the tuberculous scar as many carcinomas arise on the basis of chronic cicatrizing nonspecific inflammatory lesions. The theory that chronic tuberculosis produces damage to the mesenchyme cell system in its immediate vicinity, rather than mutation of epithelial cells, may explain the development of cancer.

—*Sidney Smedresman, M.D.*

Reproductions in the Humerus of Mammary Cancer with Special Regard to the Anatomic Disposition of the Axillary Lymph Glands (Le riproduzioni omerali del cancro mammario con speciale riguardo alla disposizione anatomica delle linfoghiandole ascellari). Mario Masturzo. *Gior ital. chir.*, 1955, 11: 460.

In a previous publication (*Gior. ital. chir.*, 1954, 10: 958) the author discussed the so-called lymphatic permeation mechanism of diffusion of mammary

carcinoma to the humerus; the spread took place along the lymphatic plexus of the aponeurosis of the pectoral muscle to its attachment to the humerus itself.

In the present article another mechanism of diffusion is discussed. It consists of lymphatic permeation from the original mammary neoplasm to the lymph glands of the axilla to the point of piercing the capsule of the glands and entering the loose areolar tissue to fill the axillary cavity. These developments in the axillary lymph glands are regarded as in the nature of metastases.

The rest of the mechanism is then in the nature of a direct diffusion from these axillary metastases to the bone itself. This progress from the axillary metastases is analogous to the classical "progress by contiguity." The author has demonstrated in human fetuses (in addition to the important lymph gland groups making up the so-called quadrilateral of Padula [*Anatomia chirurgica degli arti. Arto superiore.* Dante Alighieri, 1903]) a complex grouping of lymph glands in a more or less formative state permeating the loose axillary areolar tissue and following the courses of the large nerves and vessels of this region. These more or less undeveloped lymph gland structures become hypertrophied and undergo a process of hyperplasia which proceeds in advance of the progress of the neoplastic cells themselves, apparently being stimulated to development by some product given off by the neoplastic cells; this process is designated "para-carcinomatous reaction."

Through these new-formed channels and glandular stations the neoplastic process proceeds directly laterally, reaching and penetrating the periosteum of the humerus and developing foci of neoplastic growth within the humerus. Such process of penetration and development may also involve the other neighboring bones (clavicle, scapula); however the humerus is the structure specially considered in this article. It may also invade the adventitia of the nerves and vessels of the axilla and enclose these structures. In this process a certain selectivity is portrayed and such selectivity is assumed to be an attribute of the neoplastic cells themselves.

In this process the progress (ganglionic and periadenitic infiltration) follows the interstitial muscles not proceeding along the aponeurotic surfaces as described previously.

The process may, of course, remain restricted to the lymph glands of the axilla, and in this the histological type of the infiltrative process seems to play a part. When the axillary lymph gland metastasis is made up of the so-called solid masses of profoundly anaplastic cells, or when the anastomasis is composed of adenocarcinomatous structures lateral progress is apt to be quite active. In the sclerotic form, on the other hand, progress beyond the axillary metastatic foci is apt to be slowed down or abolished. Here again some inherent quality or capacity of the neoplastic cells seems to play the decisive role.

However, whatever the modality of diffusion in these cases, the process of development takes place entirely from the axillary metastatic foci and is entirely independent of the original mammary neoplasm.

—John W. Brennan, M.D.

Simple Mastectomy for Carcinoma of the Breast—Reported Results. W. RALPH DEATON, JR. *Surgery*, 1955, 37: 720.

A REPORT OF STATISTICS from various clinics as presented by the author indicates that simple mastectomy with roentgen therapy provides at least as high a 5 year survival rate as radical mastectomy. The reasons for this are not clearly understood at this time. A short review of various statistics by various authors is presented and the conclusion reached by the authors indicates that further investigation of the use of simple mastectomy with irradiation for the treatment of carcinoma of the breast should be done.

—John E. Karabin, M.D.

TRACHEA, LUNGS, AND PLEURA

The Plastic Repair of the Trachea and Bronchi; Presentation of 19 Cases (Reconstruction plastique trachéo-bronchique a propos de 19 cas). H. METRAS, M. GRÉGOIRE, H. LONGEFAIT, and L. HARTUNG. *J. fr. méd. chir. thorac.*, 1955, 9: 121.

THREE TYPES OF PROCEDURES for plastic repair of the trachea and bronchi can be used:

1. Dermal grafting as originated by P. Gebauer. Several points are very important. The epidermal aspect of the graft should always be placed on the side of the bronchial lumen. The suture material (stainless steel, vitallium) should not protrude into the lumen of the bronchus.

2. Bronchoplasty. This consists in a longitudinal incision of the bronchus and transverse closure of the incision. It is suited to those forms of stenosis in which there is only a sharp bend in the bronchus.

3. Resection of the strictured portion and end-to-end anastomosis.

The most frequent indications of plastic procedures on the trachea and bronchi are:

1. Cicatricial strictures of tuberculous origin. They can be of three types: the infantile type of bronchus with a decreased lumen and thin walls, stricture with marked thickening of the wall of the bronchus, and stricture due to extrinsic compression of the bronchus by a focus of burned out tuberculous infection.

2. Benign tumors.

3. Traumatic strictures occurring after a fracture of the trachea or bronchus, or traumatic compression by a ball of lucite.

4. Stricture due to extrinsic compression when the primary lesion is amenable to treatment.

In the 19 patients the indications for surgery were: strictures of tuberculous origin in 15, trauma in 2, benign tumor in 1, extrinsic compression in 1. Dermal grafting in 2 patients, plastic procedures in 3, and resection with end-to-end anastomosis in 3 were performed. The one death was due to a technical error in placing the dermal graft with the epiderm on the outside. In all cases the pulmonary function tests were considerably improved. *—René B. Menguy, M.D.*

The Masked Bronchopleural Fistula. BRUCE J. FRANZ and JAMES D. MURPHY. *J. Thorac. Surg.*, 1955, 29: 512.

MASKED BRONCHOPLEURAL FISTULAS are associated with postresection complications such as alveolar leak, space defect, and reluctant re-expansion of

lung. Masked bronchopleural fistulas follow after a period of satisfactory recovery from pulmonary resection.

In a period of one year, 65.1 per cent of a total of 1,235 lung resections were of the segmental type, and in this type of resection the incidence of air leaks was considerable. In a series of 625 patients who had undergone lung resection, 3.83 per cent developed masked fistulas characterized by pain in the chest, a sensation of moving air in the pleural cavity, and a productive cough with reddish or brown sputum. The objective findings varied. Fever returned after a postoperative period of normalcy. Roentgenograms showed an increased amount of intrapleural air or the presence of a new air pocket. The instillation of varidase intrapleurally caused an increase in bloody expectoration. Tracer dyes injected into the pleural cavity were expectorated or resulted in visualization of the bronchial tree. A persistent air pocket was demonstrable after thoracentesis. A few fistulas were demonstrable on bronchoscopy. The remaining lung of the operative side usually failed to expand or a sudden pneumothorax appeared after a period of reexpansion of the lung.

From the diagnostic standpoint, the highest number of fistulas were confirmed by the instillation of methylene blue into the thorax. In the present study bronchoscopic diagnosis was made in only one-third of the cases. Bronchograms were of limited value.

—*B. G. P. Shafiroff, M.D.*

Malignant Pulmonary Adenomatosis (L'Adenomatosi polmonare maligna). FRANCO CECCONI. *Ann. ital. chir.*, 1955, 32: 243.

CLINICALLY MALIGNANT PULMONARY ADENOMATOSIS, or alveolar cell carcinoma, is characterized by a subchronic evolution with symptoms of pneumonitis and a characteristic abundant mucous expectoration. The diagnosis is made by cytologic examination of the sputum and roentgenologic examination of the chest. The latter may be deceiving. In the author's case the round homogeneous shadow with a linear outline was at first mistaken for a lung cyst.

Histologically, the lesions are remarkable because of the alveolar appearance of the neoplastic tissue, the lack of cellular pleomorphism, the preservation of the perialveolar elastic layer in contrast to the malignant evolution, and the presence of metastases. In this respect these tumors can be compared to the so-called "malignant adenomas" of the thyroid.

Alveolar cell carcinomas very often have a multicentric origin.

If one can speak of benign and malignant forms of the disease on the basis of the absence or presence of metastases, it still remains that the histologic picture is essentially similar in both forms, which should be considered as malignant lesions.

In certain areas of the tumor one may find foci of atypical cells which could be the origin of metastatic phenomena, in the presence of which the metastatic foci often have the histologic picture of common carcinoma.

There is no evidence, experimental or otherwise, for associating these tumors with an infectious process.

—*René B. Menguy, M.D.*

Spontaneous Pneumothorax: the Case for Early Thoracotomy. RODGER E. MACQUIGG. *Am. Surgeon*, 1955, 21: 478.

AT PRESENT there still is wide variation in the therapy of true spontaneous pneumothorax, and the pathogenesis of the condition remains partially obscure; however, it seems to involve a probable congenital weakness of the surface of the lung in certain individuals. It has been noted at exploration that the leaks are almost always associated with blebs or bullae which usually are in the apical region and that pleural adhesions are usually present. The constant tug on the lung near the leak seems important not only in its creation but also in maintaining it until epithelization occurs in the chronic or recurrent case. As the lung in many patients has expanded completely after conservative therapy, with recurrence of the condition when adhesions were present, early thoracotomy, lysis of the adhesions, and, after conservative local excision of the bullae, abrasion of the pleura with dry gauze seem justified, and because of the increasing number of contributions containing similar views, it is believed that spontaneous pneumothorax, particularly if there is any evidence of recurrence, should no longer be considered a medical disease. This is especially the case since thoracotomy under proper conditions has attained such great safety that in the majority of patients conservative treatment with its attendant ultimate risk and immediate economic loss is not in the best interest of the patient.

Two case reports are presented in confirmation of the author's thesis, and the conclusion is reached that a study of several dozen cases, followed up for at least 10 years after operation, will be required for ideal quantitative proof of the results of this type of therapy.

—*Stephen A. Zieman, M.D.*

On the Relative Indications for Extrapleural Pneumothorax and Thoracoplasty (Sulle indicazioni relative del pneumothorace extrapleurico e della toracoplastica). M. ANZALONE, M. DOMENICI, and A. VALLI. *Chir. torac.*, 1955, 8: 27.

AS FAR AS AGE is concerned thoracoplasty is inadvisable in patients under the age of 17 or 18. If surgical treatment is mandatory in patients under that age an extrapleural pneumothorax is the operation of choice. Not only is thoracoplasty not contraindicated in elderly patients but it is often quite beneficial.

When there are active extrapulmonary lesions undermining the general condition of the patient the contraindication to surgery is no longer absolute since they are amenable to kymotherapy and chemotherapy.

It is not advisable to operate on patients in whom active pulmonary lesions are causing fever and loss of weight, although an extrapleural pneumothorax could be performed in face of such a situation if the condition of the lungs so required.

According to most authors the minimum vital capacity compatible with surgery is 1,200 c.c. with a minimum of 15 inches for the inspiratory apnea. Roentgenological examination of the chest may help in estimating the functional status of the lungs: mobility of the diaphragm and pleural symphysis.

The optimum indications for thoracoplasty are lesions situated above the posterior arch of the seventh

rib, preferably away from the mediastinum. In high paramediastinal lesions an extrapleural pneumothorax is the procedure of choice. If the lesion is apical, surgery is contraindicated when the dimensions are greater than 4 by 5 cm. These limits can be widened when the lesion is in the midlung or in the base.

Bronchoscopic examinations should always precede surgery.

Among ideal indications for a thoracoplasty are ulcerated miliary lesions of the apices with thickened pleura and stationary apical cavities, while an extrapleural pneumothorax is indicated in the presence of circumscribed apical and subclavicular ulcerating lesions without pachypleuritis, exudative forms in a subacute phase, or circumscribed ulcerating bronchopneumonia in the upper two-thirds of the lung. Bilaterality is not an absolute contraindication. A bilateral extrapleural pneumothorax is preferable by far to a bilateral thoracoplasty.

As examples of the various criteria used by the authors in the selection of patients several case histories are given. —*René B. Menguy, M.D.*

One Stage Thoracoplasty with Apicolysis (Thoracoplastie supérieure en un temps avec apicolyse et enfouissement). ALFRED DUMONT, A. DUPREZ, R. MAMPUYS, H. DURIEU, and F. DECLERQ. *Acta chir. belg.*, 1955, 54: 151.

THE AUTHORS advocate a one stage thoracoplasty with apicolysis in certain selected cases of tuberculosis. The best results were obtained in patients with cavities not larger than 6 cm. in diameter located in retroclavicular or supraclavicular sites.

In the operation apicolysis of the pulmonary summit is artificially maintained without a prosthesis by surgical roofing of the lung below. This is obtained by suturing the mediastinal pleura, the thick parietal pleura at the apex, to the first three intercostal bundles. Within 3 weeks this produces a rigid fibrous seal which definitely maintains the pulmonary summit below the clavicle. The advantages of this technique are evident: absence of a prosthetic foreign body, reduction of functional loss, and good maintenance of pulmonary immobilization. The complications were few.

The results in these 36 cases after one year were classified as successful in 25 and failures in 11.

The authors maintain that if the limitations and indications of this operation are respected there should be a rise in the rate of long term cures. They recommend this type of thoracoplasty in certain advanced lesions preliminary to resection for objective immobilization to stabilize the pathologic process.
—*Andrew Z. Speare, M.D.*

Resection and Anastomosis of the Bronchus Carried Out in a Case of Benign Tumor. ANDRÁS BIKFALVI and SÁNDOR DUBECZ. *J. Thorac. Surg.*, 1955, 29: 488.

THE AUTHORS REPORT a resection of the right main bronchus with restoration of the intermediate and lower lobes of the lungs by end-to-end anastomosis to the carina. This operation was performed on a 42 year old male with a history of recurrent hemoptysis.

Bronchoscopic biopsy on the first occasion revealed an oat cell carcinoma, but on the second biopsy the tissue was described as an adenoma of the bronchus. Removal of the tumor by bronchotomy was not possible. A 3 cm. segment of the right main bronchus was removed and the two remaining lobar bronchi were sutured to the trachea without a prosthesis.

A successful result was obtained because of strict asepsis, an airtight suture line, exact joining, the avoidance of overtautness, a nonstenotic anastomosis, and complete and immediate ventilation with expansion of the lung. —*B.G.P. Shafiroff, M.D.*

Residual Caverns After Apical Thoracoplasty (Les cavernes résiduelles après thoracoplastie apicale). H. JOLY. *Poumon*, 1955, 11: 241.

THE AUTHOR discusses the management of residual cavities in the apex of the lung. The course of this condition and the indications for intervention have changed basically since the introduction of antibiotics in the treatment of tuberculosis.

During the period from 1950 through 1955, 636 patients were subjected to surgery for residual cavities. Thoracoplasty was done in 295 (47%) and extrapleural pneumothorax, pneumolysis, or extirpation of the affected portion was performed in the others. As many as 81 per cent of the thoracoplasties resulted in complete bacteriological and radiological cures. The author ascribes this excellent result to three factors: (1) all cases were treated with specific antibiotics all through the surgical phase; (2) in most of these cases, the patients had not been treated with these antibiotics prior to the intervention so that they were most effective; (3) very few complications occurred in the postoperative period. Furthermore, the use of prostheses of plastic material (acrylic) permitted maintenance of the collapse obtained by rib resection and prevented secondary re-expansion of the lung. In 151 of the 295 thoracoplasties a temporary prosthesis was applied; in 102 cases, the prosthesis was permanent. Finally, a number of cases with a poor prognosis for thoracoplasty were treated by periosteal pneumolysis, and thus the proportion of failures of thoracoplasty was reduced.

The indications for the various surgical procedures are discussed in detail. The picture is considerably changed since the introduction of the antibiotics which reduced the risk of lung exeresis and extramusculoperiosteal pneumolysis. If the cavity is not more than 1 cm. in diameter, superior thoracoplasty in one stage with resection of the upper four or five rib arches gives good results. In the majority of cases the writer prefers to combine thoracoplasty with the application of a permanent plastic prosthesis. As most of the cavities are rather rigid and do not collapse readily, the author aims at a condition of permanent atelectatic collapse by the use of the prosthesis.

More and more frequently extramusculoperiosteal pneumolysis is done. This intervention has several advantages over thoracoplasty: it gives a more thorough collapse of the cavity and at the same time avoids development of scoliosis and other thoracic deformities, and it interferes little with the respiratory function of the healthy portion of the lung.

Finally, the writer discusses the indications for exeresis. If thoracoplastic therapy has not succeeded

in collapsing the cavity, and, especially, if the sputum remains positive one should not wait for more than 6 to 12 months before deciding on exeresis, provided that the general condition permits the intervention. On the other hand, in many cases exeresis is too risky in view of the general condition and the surgeon has to content himself with the palliative result of thoracoplasty and the prolonged use of antibiotics.

—*Werner M. Solmitz, M.D.*

Residual Cavities Following Thoracoplasty and Their Treatment (Les cavernes résiduelles après thoracoplastie et leur traitement). A. MAURER and L. TOTY. *Poumon*, 1955, 11: 201, 217.

MAURER describes the historical development of the technique of thoracoplasty through four periods, namely, from 1885 to 1928, 1928 to 1931, 1931 to 1948, and from 1948 to date. In the last period the whole problem of residual cavities has been changed by the advent of antibiotics and chemotherapy, exeresis, and the use of acrylic filling. Rest and antibiotic treatment should be tried for at least 8 to 12 months before operation is done. Surgery is indicated only in the absence of signs of retrogression. If thoracoplasty will involve the resection of more than 6 ribs, and indications for exeresis are equal, the latter is preferable. Discussion persists as to which of these two methods is indicated in the presence of a cavity when the upper lobe bronchus is stenosed. In medium or small-sized cavities surrounded by healthy parenchyma, either method may be used. If the parenchyma surrounding the cavity has been involved for some time, however, it is better to do a partial thoracoplasty than a segmentary exeresis.

With modern antibiotic treatment and chemotherapy a large percentage of cavities will heal, and if thoracoplasty should be required, the much feared homolateral and contralateral inseminations are avoided. If exeresis is done for the larger and poorly located cavities and thoracoplasty is done in properly prepared patients, residual cavities will be rare.

Difficult cases are still encountered, however, including cavities with pericavitary lesions persisting after prolonged rest cure and adequate antibiotic treatment, with thick walls resistant to collapse. So-called poorly located cavities will not benefit from exeresis. Exeresis is impossible in old patients with heart trouble or respiratory insufficiency as the other lung may be sclerotic, emphysematous, or tuberculous.

These patients often suffer from hepatic insufficiency or alcoholism. Thoracoplasty under local anesthesia may prove beneficial. However, in such cases operation should be done in several stages without costal resection or removal of the transverse apophyses. The incidence of residual cavities increases in direct proportion to the number of such cases included in a series, and will reach a maximum if thoracoplasty is reserved for poor cases only using exeresis for the rest. Occasionally a preoperative pneumoperitoneum, a Monaldi drainage or speleostomy may prove helpful. Thoracoplasty and lucite filling may also be considered. Speleostomy may be intercalated between the stages of a thoracoplasty.

Toty concludes that permanent filling with lucite balls when judiciously applied may give as good results as thoracoplasty, if not slightly superior ones. However, because of possible complications and recent changes in surgical indications, the benefits resulting from collapse are not sufficient to justify this method in classic indications. Its use has been restricted and is definitely contraindicated in cases with severe functional insufficiency. The patient should be instructed that he must not consider resuming his normal occupation for at least a year after operation. Without adequate postoperative treatment reduction in the size of the cavity may be delayed and cicatrization may be unsatisfactory. Even with exeresis postoperative treatment is imperative. Physical therapy can be applied during this time to prevent or correct deformities, the fear of which should never interfere with a decision to operate when indicated. Return to work must be gradual and under strict supervision for several years with regular bacteriologic and radiologic follow up.

The treatment of residual cavities after thoracoplasty is discussed by Toty. He states that in spite of recent therapeutic advances, residual cavities follow thoracoplasty in 3 to 30 per cent of the cases, most of the statistics being incomparable because of the entirely different basis for the selection of cases as well as for their preparation and treatment.

The high incidence of residual cavities indicates that operations are still done on patients apparently cured by antibiotics in whom old extensive sclerotic lesions respond poorly to collapse. The most risky cases are reserved for thoracoplasty rather than exeresis, as in case of failure thoracoplasty allows further operation for the cure of any lesions that have escaped its action. An anatomic pathologic study of residual cavities after thoracoplasty and after exeresis is presented by G. Canetti and J. Chretien. It is emphasized that many patients have more serious involvement than their clinical symptoms would suggest. Preoperative preparation must be most meticulous, and when perifocal reactions indicate a recurrence of the cavity, operation may be postponed until stabilization of the lesions. Meticulous examination is indicated to avoid reintervention on sterile lesions that are not dangerous and fairly stable. Reoperation is never indicated before 6 months and rarely before a year. The treatment of residual cavities following thoracoplasty consists in resection of the lung. If exeresis is impossible, repeated collapse or speleostomy may be indicated. The indications for each of these interventions are discussed. In 7 cases, or 39 per cent of a series of 18 cases treated by repeated collapse, successful results were obtained, while exeresis yielded successful results in 57 of 62 cases or 91 per cent. In the series of 62 resections there were 2 deaths and 9 complications, the latter including 8 bronchial fistulas and 1 homolateral relapse. The 62 resections included 9 pneumonectomies and 53 partial exereses.

Following a discussion of the surgical technique and results, the author proceeds to describe the anatomic changes in the partially resected hemithorax that may interfere with proper refilling of the apex of the pleural cavity emptied by the parenchymatous resection. He contributes a schematic presentation of 3 types of hemithorax based on the angle of the regenerated breast plate with the mediastinum. The problem

of filling differs for each (Fig. 1). In type I the angle is greater than 45 degrees, in which case the lung has every chance to re-expand and symphysis of the lung to the wall and mediastinum affords adequate protection for the bronchial suture. In type II the angle is near or less than 45 degrees and refilling is more difficult but not impossible, with resulting pleural cavities and the risk of infection of bronchial sutures. In type III the angle is near or less than 30 degrees and the top of the hemithorax takes on the shape of a church spire. Covering of the bronchial suture with parenchyma then becomes problematic or impossible. Seven illustrative cases are described in detail.

The symptoms of bronchial fistulization are described in detail, including positive bacillary findings, parietal complications, immediate postoperative complications, and serosanguineous expectoration. In the early cases of bronchial fistulization drainage with continuous aspiration is indicated, although it is not always easy. The prognosis is better in the cases in which fistulization develops later, several months after the operation. Here endoscopic treatment and antibiotics may suffice. In 2 cases the fistula was parietal. Pneumonectomy was done in one patient who is still under treatment and thoracotomy in the other, in whom a secondary axillary exposure became necessary and left a large surface for epithelization.

It is concluded that exeresis is at present the treatment of choice for residual cavities after thoracoplasty. Satisfactory results may be expected, the author reporting successful results in 91 per cent of his cases. Rehabilitation of the hemithorax presents no problem in cases of type I and only rarely in those of type II, but becomes more complicated in cases of type III in which the persisting pleural sac presents a source of complications, the most severe being bronchial fistula. This may be prevented during operation by avoiding septic maneuvers or injury to the cavity during liberation of the parenchyma, or, if this is impossible, by careful toilet and curettage. Fixation of the remaining pulmonary parenchyma to the apex of the thorax should be accomplished, if possible, after insuring complete filling of the plastic canal and covering the bronchial suture.

In the postoperative period, bronchial fistulization can best be prevented by facilitating pleural drainage and ascent of the parenchyma by placing the patient in an inclined position and instituting a pneumoperitoneum.

These precautions will reduce the number of complications of exeresis following thoracoplasty. The best preventive would be avoidance of a mutilated hemithorax. Indications for thoracoplasty should be restricted especially when an extensive thoracoplasty seems necessary. Possibly the association of exeresis followed by collapse might offer an interesting solution to the treatment of cavitary lesions difficult to collapse. The author has tried this method in a dozen cases, performing the operation in two stages, i.e., resection in the first stage, followed 15 days later by thoracoplasty. To date only favorable results have been recorded. Other advantages accruing from secondary thoracoplasty include the avoidance or neutralization of distention of the remaining parenchyma, modeling of the thoracic wall to the lung and insuring complete obliteration of any persisting pleural pockets. Thus the patient is given the benefit of precious time with prophylaxis of residual cavities and avoidance of the complications that attend their secondary exeresis.

—*Edith Schanche Moore*

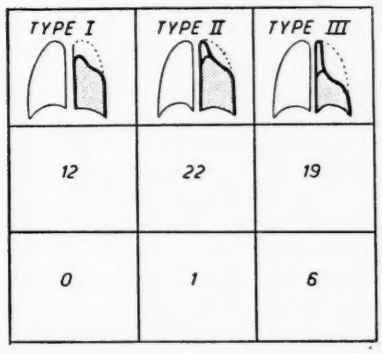


FIG. 1 (Maurer, Toty). Distribution of Bronchial Fistulas According to Morphology of the Thorax. a, No. of exereses. b, Fistulas.

HEART AND PERICARDIUM

Experimental Transbronchial Cardioangiography. MANSUR TAUFIC and JOSEPH J. ASTA. *J. Thorac. Surg.*, 1955, 29: 676.

SATISFACTORY ROENTGENOGRAMS of the left ventricle have been obtained by the direct injection of an opaque material into the chamber. The left atrium does not visualize with this technique. This study extends this technique in the experimental animal by the direct injection of the left atrium. Two normal dogs and 4 dogs with experimentally produced interventricular septal defects were studied. The presence of a septal defect was established by physical findings, phonocardiographic studies, and cardiac catheterization.

Under pentobarbital anesthesia, a bronchoscope was passed to the carina. A tube with a 15 gauge needle, which was filled with saline solution, was passed through the bronchoscope and inserted into the left atrium through the wall of the left main stem bronchus at a point 1 cm. from the carina. The presence of the needle in the atrium was ascertained by the aspiration of bright red blood into a syringe attached to the tube. Seventy per cent diodrast was then injected under pressure (1 c.c./kgm. of body weight) and roentgenograms were taken with a rapid film changer.

The roentgenograms of the normal animals revealed good detail of the left atrium, left ventricle, arch of the aorta, and bronchocephalic arteries. In the animals with interventricular defects the shunt of contrast material from left to right was noted in every case.

This method is presented because of its potential value in diagnosing intracardiac lesions such as septal defects and the differentiation of mitral stenosis and mitral insufficiency. —*John H. Davis, M.D.*

Treatment of Penetrating Wounds of the Heart: Experimental and Clinical Observations. Denton A. Cooley, J. Ralph Dunn, H. LeRoy Brockman, and Michael E. DeBakey. *Surgery*, 1955, 37: 882.

In order to evaluate the operative and nonoperative treatment of penetrating wounds of the heart and pericardial tamponade, a series of experiments was performed to determine the factors influencing survival under these circumstances. More than 100 adult mongrel dogs were used.

The experiments included cardiac tamponade induced in the anesthetized animal by instilling saline solution in 20 to 25 c.c. increments into the pericardial sac, and experiments conducted to determine the factors influencing survival in cardiac wounds and the effect of the myocardial damage itself upon the circulation. In experimental pericardial tamponade relatively small reduction in the volume of pericardial fluid produces an immediate and strikingly favorable influence upon the circulation. The vasoconstrictor drug, norepinephrine, also proved to have a favorable effect upon the circulation through elevation of the systemic blood pressure. On the other hand, alternating positive pressure insufflation of the lungs in the presence of pericardial tamponade produced an unfavorable effect upon the circulation.

Approximately 30 per cent of the animals wounded by a specially designed expansible blade died and 80 per cent of these within the first 30 minutes. The majority of the dogs surviving the critical immediate period but dying in the next few hours presumably could have been saved by resuscitative measures. This suggests that patients who arrive at the hospital alive at least 30 minutes after injury have a type of cardiac wound that provides a reasonably good chance for survival. These observations would seem to support the advocacy of the nonoperative management of penetrating wounds of the heart.

Since January 1, 1951, the surgical staff at Jefferson Davis Hospital, Houston, Texas has treated penetrating wounds of the heart by nonoperative means as the method of choice. Between January 1, 1951, and October 31, 1954, 57 patients were admitted to the emergency ward with penetrating wounds of the heart. These included all patients admitted with any sign of life whatsoever, although some died immediately after admission and before any method of treatment could be instituted. Thus, among the 15 patients in whom pericardicentesis was not performed, 5 died in less than 10 minutes after arrival at the hospital. Among the 57 patients with cardiac wounds, 28 were treated by nonoperative means alone and in 14 (24.6%) cardiorrhaphy was attempted. Approximately 30 per cent of the 57 patients died. However, the mortality rate of the group treated by operative means was five times that of the nonoperative group. It is true that the patients treated surgically were the ones with the most severe injuries, requiring more aggressive measures. On the other hand, among the 7 survivors in the operative group were 4 patients in whom thoracotomy revealed that exploration was unnecessary because the laceration had sealed off completely.

On the basis of the observations presented, nonoperative management is recommended in all cases, either as specific therapy or as a preparatory measure to emergency thoracotomy in the patients in whom response to this method of treatment is not maintained.

—*Stephen A. Zieman, M.D.*

Digital Exploration of the Cardiac Cavities and Mitral Murmurs (Exploration digitale des cavités cardiaques et souffles mitraux). R. Lutembacher. *Presse méd.*, 1955, 63: 801.

Most investigators assume that all cases of mitral stenosis are necessarily combined with a certain degree of mitral regurgitation, although in many cases auscultation reveals only a presystolic and no systolic murmur.

Digital exploration during commissurotomy frequently showed findings conflicting with the clinical diagnosis. In some cases no systolic reflux was found in spite of a systolic murmur; in a number of other cases mitral regurgitation was present in addition to stenosis, although no systolic murmur was heard before the intervention.

The author of this article emphasizes that the presence or absence of regurgitation does not depend on the shape and deformation of the bicuspid valves only but on the configuration of the entire mitral cone and the muscular pillars. An existing regurgitation can be made to disappear by digital manipulation of the muscles during the exploration; on the other hand, under certain conditions manipulation during commissurotomy can produce regurgitation.

—*Werner M. Solmitz, M.D.*

Neoplastic Invasion of the Heart and Pericardium. Gene U. Cohen, Thomas M. Peery, and John M. Evans. *Ann. Int. M.*, 1955, 42: 1238.

The authors call attention to the frequency of neoplastic invasion of the heart and pericardium, and present the clinical features which may facilitate the antemortem diagnosis. The incidence of cardiac metastases in autopsy reports based only on the patients dying with malignant tumors varies widely from 2 to 21 per cent. Although cardiac metastasis may arise from a malignant neoplasm in almost any organ, carcinoma of the breast, bronchogenic carcinoma, malignant melanoma, and the malignant lymphomas constitute the most frequent offending lesions. Most of these tumors reach the heart or pericardium by direct extension from neighboring intrathoracic organs.

The second most frequent pathway is by invasion of the pulmonary veins and implantation within the myocardium via coronary artery embolization. Less commonly, hematogenous dissemination from more distant sites and retrograde lymphatic extension may occur. Pericardial metastases are more common than myocardial metastases, and endocardial metastases are rare.

In a series of 1,007 consecutive autopsies performed during a 57 month period, 315 malignant neoplasms were recorded. In 65 of these the heart, pericardium, or both were involved, an incidence of 6.5 per cent of all autopsies, or 20.6 per cent of all malignant neoplasms coming to autopsy. The pericardium was involved in 39 cases, the myocardium in 42 instances, and the endocardium in only 7 cases. In 35.4 per cent

of the cases the primary neoplasm was in the breast, in 18.5 per cent in the bronchus; 15.4 per cent were among the malignant lymphomas, and 7.7 per cent were malignant melanomas. Together, these comprised 76.9 per cent of the primary sites.

Among the 65 patients in the author's series there were 25 with congestive heart failure, 15 with cardiac arrhythmias, and 14 with pericardial effusion. Pericardial or cardiac involvement was diagnosed correctly ante mortem in 3 of 9 patients in whom signs of cardiac compression were detected, and suspected in 2 patients, in one on the basis of an irregular cardiac silhouette in the roentgenogram and in the other on the basis of a transient pericardial friction rub. These case reports are included.

Attention is drawn to the development of one or all of the triad of cardiac failure, cardiac arrythmia, or cardiac compression in patients known to have malignant disease. These symptoms could suggest the possibility of metastases to the heart or pericardium.

—*Edmund A. Gorvett, M.D.*

The Surgical Treatment of Mitral Insufficiency. EARLE B. KAY and FREDERICK S. CROSS. *Surgery*, 1955, 37: 697.

MITRAL INSUFFICIENCY may result from absolute loss of valve substance from cicatricial contraction of the valve leaflets, fixation of the leaflets in the open position by contraction of the chordae tendineae, or by relative loss of valve substance from dilatation of the mitral ring secondary to left ventricular hypertrophy and dilatation in the attempt to increase cardiac output. Any one of these conditions, either alone or in combination, may occur. The regurgitant flow of blood can be stopped as determined by the intracardiac finger, by pushing the posterior wall of the auricle at the site of the mitral valve forward or anteriorly and thereby decreasing the size of the mitral ring in an anteroposterior direction. The valve leaflets of the heart can be made to approximate and the incompetence can be relieved by approximating the mitral ring at the posteromedial commissure. The status of the mitral valve is determined by palpation with the intracardiac finger inserted through the auricular appendage. Any associated mitral stenosis is first relieved by commissurotomy. The chordae

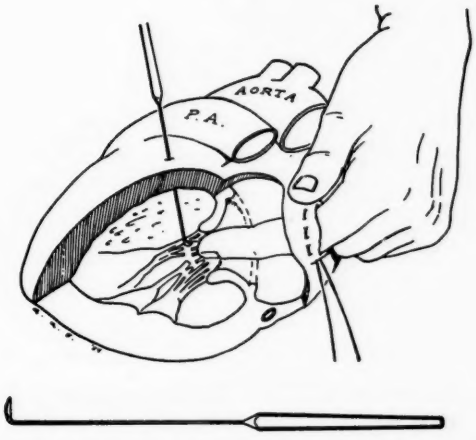


FIG. 1 (Kay, Cross). Diagrammatic sketch of severing the more foreshortened chordae tendineae responsible for maintaining the mitral valve in the open position by a right-angled neurectomy knife introduced through the left ventricle and guided by the intracardiac finger.

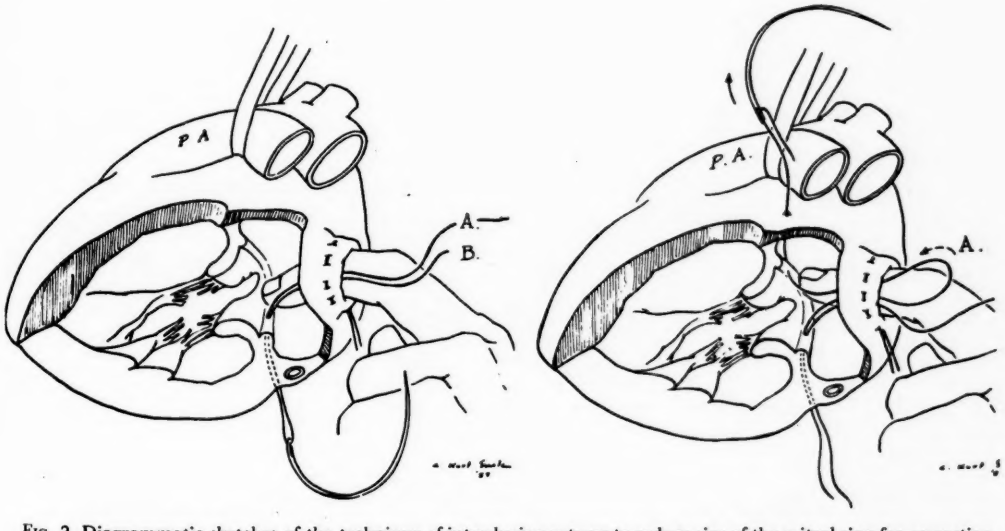


FIG. 2. Diagrammatic sketches of the technique of introducing sutures to reduce size of the mitral ring for correction of mitral regurgitation. Several sutures are so placed, drawn taut, and tied over sections of cartilage or pericardium.

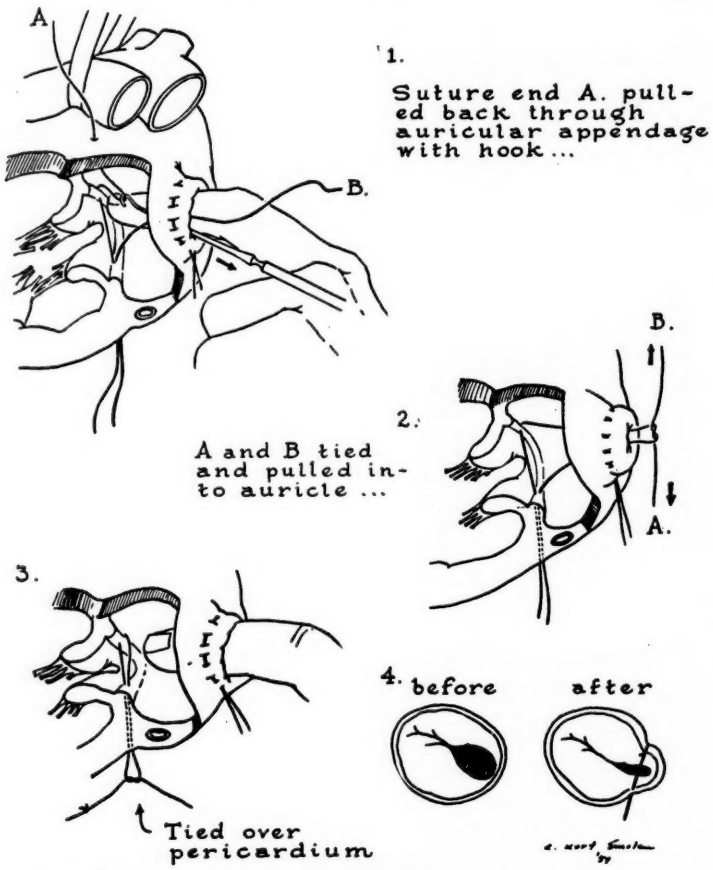


FIG. 3. (Kay, Cross.) Diagrammatic sketches of variation in technique of introducing suture through septal aspect of mitral annulus to decrease its size and in turn correct the mitral regurgitation.

tendineae are mobilized by means of a right-angled neurectomy knife inserted into the left ventricular chamber, guided by the intracardiac finger (Fig. 1).

The dilated atrioventricular ring is decreased in size in the following manner:

A No. 1 silk suture is introduced, by means of a large, curved, blunt needle, into the left auricular chamber at the junction of the aorta and the auricle, adjacent to the auricular septum. The needle is directed by the intracardiac finger to engage a segment of the mitral ring both anterior and posterior to the posteromedial commissure and to exit posteriorly beneath the coronary sinus in the area free of the circumflex coronary artery. If the left auricle is particularly enlarged, these sutures are placed by introducing the needle through the auricular appendage opening, through the anterior segments of the annulus, and out at the junction of the aorta and auricles. The other suture is then threaded and passed in a similar manner through the posterior segments of the annulus and out posteriorly. Two or three of these sutures are so placed. Anteriorly the sutures are threaded over small sections of cartilage. The sutures are then drawn taut by the assistant, thereby approximating the annulus at the posteromedial commissure as determined by the intracardiac finger, and tied over segments of pericardium (Fig. 2).

In some patients the size of the heart and the position of the atrioventricular ring in relation to the junction of the aorta and auricular septum is such that the distance between these two points is too great to allow the sutures to be properly placed and tied. In such instances the anterior suture is obtained in the space between the annulus and anterior auricular wall by means of a right-angled nerve hook. This is withdrawn through the appendage opening, rethreaded, and passed out as before where it is tied to the other end (Fig. 3).

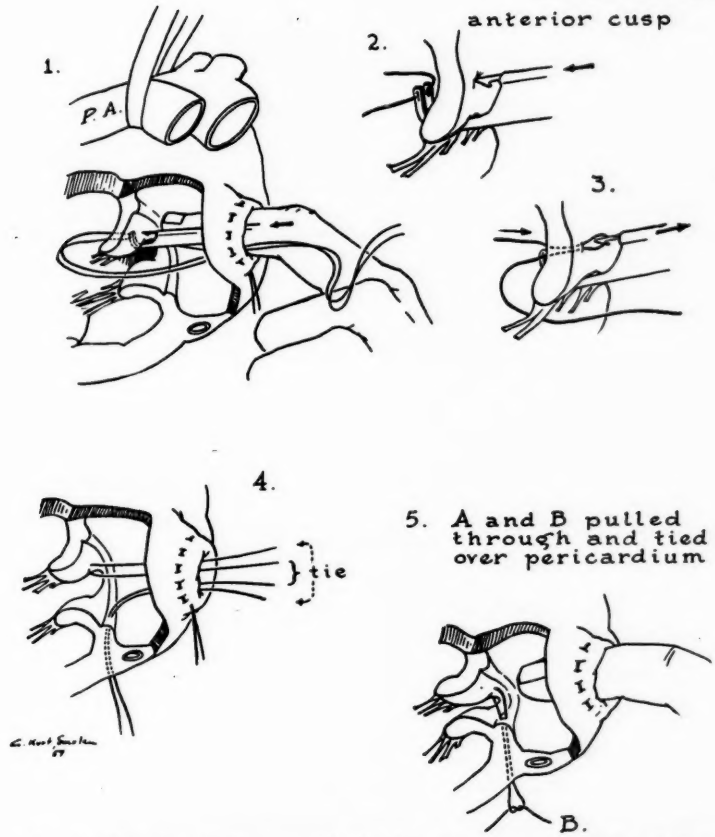


FIG. 4. (Kay, Cross.) Diagrammatic sketches of another variation in technique for introducing suture dependent upon surgical findings present.

Figure 4 illustrates a further variation of technique of introducing sutures. The technique chosen depends upon the surgical findings.

Four patients were operated upon successfully by the authors. There was one death following discharge from the hospital. The results were very encouraging.

Figure 5 illustrates the use of a pericardial strip as a substitute for silk to approximate the anterior and posterior lips of the dilated mitral annulus. This has been suggested in the situation in which is impossible to approximate the anterior and posterior segments of the annulus at the site without leaving the suture suspended within the atrial chamber because of the intervening scar or calcium, or when the distance between the two points is too great because of the enlarged left auricle. The regurgitant jet can be eliminated by this technique.

The new surgical technique in the treatment of mitral regurgitation as suggested by the authors is ingenious and should be considered in the technique to be followed in these cases.

—*John E. Karabin, M.D.*

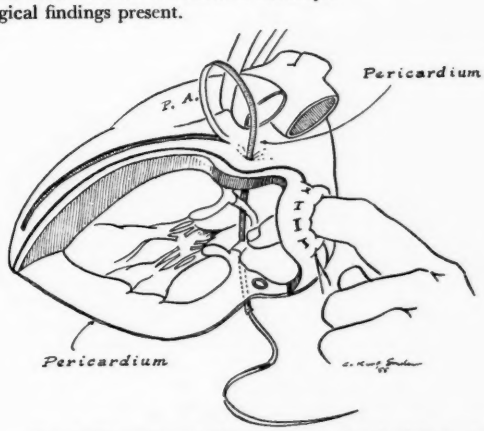


FIG. 5 (Kay, Cross.) Diagrammatic sketch of the technique in which a pericardial strip is substituted for the silk suture to approximate the anterior and posterior lips of the dilated mitral annulus at the posteromedial commissure in the treatment of mitral regurgitation.

A Maneuver for Extracting Clots from the Atrium at the Time of Mitral Commissurotomy, with Reports of 4 Consecutive Cases. WILLIAM L. JAMISON, K. V. S. RAO, and C. P. BAILEY. *J. Thorac. Surg.*, 1955, 29: 541.

THROMBI IN THE AURICLE are ball-like clots attached to the myocardial wall by a thin pedicle. These thrombi average 3 to 4 cm. in diameter and wave freely in the blood stream of the heart.

Prior to the manipulations of mitral commissurotomy, the auricular appendage is enclosed in a purse string suture and the left common carotid artery and the right innominate artery are temporarily clamped. This technique reduces the hazard of embolization to the brain, but the threat of embolization to other viscera still exists unless the clot or clots are removed from the heart. Contraction in size of the auricular appendage or fibrosis of its wall is indicative of intraluminal clotting.

Search for thrombi in the heart should be performed only when the innominate and carotid arteries are constricted. The ungloved index finger is used, the clot being compressed between this finger and the atrial wall and then delivered into the auricular appendage where the thrombus can be grasped with a clamp and removed. During the procedure, the Rumel tourniquet is held in the loose position. The anesthetist is alerted to pump blood into the patient to compensate for the loss of blood as it gushes out from the wound, washing with it all other smaller thrombi. The appendage is then pinched off between the finger and the thumb, after which the commissurotomy is performed.

Four case histories are included to illustrate this technique as described. —*B. G. P. Shafiroff, M.D.*

Present Results of Our Experiences Concerning Hypothermia in Cardiac Surgery (Résultats actuels de nos éxpériences concernant l'hypothermie en chirurgie cardiaque). CLAUDE D'ALLAINES, P. MATHIS, P. GUILLEMIN, R. GUILLEMOT, and Others. *Presse méd.*, 1955, 63: 843.

THE AUTHORS report the results of cardiac surgery under hypothermia in a series of 76 dogs. The purpose of the researches was to find out the optimal temperature for interventions on the heart and the time during which the circulation can be interrupted without permanent damage to either the brain or the heart.

Different procedures were applied to counteract the dangers of hypothermia: hyperventilation of the lung with pure oxygen; use of various drugs including ganglioplegic peripheral hyperpressors, cardiac tonics, and anticholinesterasics (prostigmine); finally the effects of intracoronary and intracarotid blood perfusion were studied.

Induction of hypothermia was started only after the animal was put to sleep with intravenous pentothal anesthesia and intubation had been performed. Of the various cooling techniques the authors prefer the Swan method: the animal is immersed in melting ice of 2 degrees C. This procedure is the safest and the most rapid; one hour is sufficient to lower the temperature by 10 to 12 degrees C. The hypothermia should always be combined with hyperventilation with pure oxygen. Hyperventilation reduces acidosis and hyperpotassiemia, the causes of ventricular fibrillation.

Other cooling methods which were used with unsatisfactory results were: (1) the Laborit method (hibernation method), (2) the cooling mattress, (3) cooling of the circulating blood (the blood was taken from the femoral artery and, after cooling, reinjected in the femoral vein, and (4) cooling of the brain (blood is taken from the common carotid and, after cooling, reinjected in the distal stump of the carotid).

Opening and exploration of the left ventricle which was performed in 43 animals presents two dangers: air embolism in the coronary arteries and ventricular fibrillation. Prevention of ventricular fibrillation is one of the major problems in surgery of the ventricle whereas opening of the auricle or of the pulmonary artery never did provoke fibrillation. Air embolism can be avoided if all the air is evacuated before closure of the ventricle. The most effective way to prevent ventricular fibrillation is by injection of prostigmine in the coronary artery 20 to 30 seconds after the arrest of the circulation. The cardiac rhythm is slowed down considerably by prostigmine and fibrillation can be avoided in most cases. However, even if fibrillation occurs it is not an irreversible condition as earlier workers assumed. The authors of this article found that the combination of prostigmine, intracardiac adrenalin (injected in the heart), electric shock, and cardiac massage succeeded in restoring the normal rhythm in most of the cases.

The optimal temperature at which the circulation can be interrupted without irreversible damage to either the myocardium or the brain is about 26 degrees. If the temperature was lowered below 25 degrees fibrillation nearly always occurred, and at a temperature of 19 degrees almost all of the animals died.

At a temperature of 26 degrees the interruption of the circulation was well tolerated by the myocardium for a period of 30 minutes, provided that the animal was supported by hyperventilation with pure oxygen and the intracoronary administration of prostigmine. However, all of the animals died from cerebral anoxia after the intervention.

The authors attempted to prevent the damage caused by cerebral ischemia by perfusing the brain of the animals with oxygenated blood via one or both carotids or the vertebral arteries. However, these experiments were without success and all of the animals died of cerebral damage. Although the myocardium would tolerate a much longer interruption of circulation, continuous clamping of the great vessels cannot be maintained for more than 15 to 20 minutes without fatal cerebral damage.

This interesting article should be studied in the original. —*Werner M. Solmitz, M.D.*

The Clinical Syndromes in Patent Ductus Arteriosus. IVAN J. PINTO. *Am. Heart J.*, 1955, 50: 1.

THE VARIOUS SYNDROMES seen with patent ductus arteriosus have been classified on the basis of auscultatory findings, since the murmurs, and the electrocardiographic and roentgenologic findings vary widely in individual cases. A large group of patients with this relatively simple congenital cardiovascular anomaly have been studied by cardiac catheterization and electrocardiographically, and the findings have been

correlated with the physical findings, so that this classification may assist bedside diagnosis.

Group A included cases with continuous murmurs at the pulmonic area. It was subdivided into those (1) with, or (2) without apical diastolic murmurs. Type (1) included about 90 per cent of the cases of patent ductus arteriosus. Roentgenographs and electrocardiographs were normal, the left to right shunt was small, and normal pulmonary arterial pressures were found. These cases could be differentiated acoustically from such anomalies as aortic stenosis with incompetence, Graham Steell murmur, ventricular septal defects, and others. Patients of type (2) usually developed respiratory and congestive heart failure in infancy. The pulse pressure was wide. Roentgenographically, the pulmonary arteries were enlarged, showed a hilar dance, and the peripheral lung fields were hypervascular. The left ventricular and possibly the left atrial chambers were enlarged, and there was heart strain on the left side. The left to right shunt was large, making surgical correction imperative. These cases had to be distinguished from acyanotic heart disease entities such as pulmonary stenosis, coarctation of the aorta, and others.

Group B cases had atypical murmurs at the pulmonic area, (1) without, and (2) with apical diastolic murmurs. Subgroup 1 consisted of (a) cases showing no cyanosis and (b) cyanotic cases due to reversal of the shunt. The findings of type (1-a) may develop at any age, and were associated with limited cardiac reserve. There was always an accentuated or split second pulmonic sound. Type (1-b) was seen in the third or fourth decades of life. Cyanosis was more prominent in the legs and had to be differentiated from other cyanotic conditions, usually by cardiac catheterization. Younger patients comprise the cases of type (2) of Group B. The sounds on auscultation simulated those of type (1), but the apical diastolic murmur was present, pulmonary arterial pressures were raised, and the left to right shunt was larger than in other types.

In group C there was no murmur at the pulmonic area. In these infants congestive failure could still occur. Aneurysmal dilatation of the ductus might suppress a previous murmur. With the given classification the indications for surgical correction were discussed. Surgery might be life-saving for infants of group B type (2). Detailed auscultatory findings and illustrative case reports with laboratory data were included. —*Emile L. Meine, Jr., M.D.*

Operative Correction of Coarctation of the Aorta in Infants; Report of 2 Cases. GEORGE R. MINOR, MCLEMORE BIRDSONG, BUCHANAN MCKAY, and JAMES P. BAKER. *J. Thorac. Surg.*, 1955, 29: 558.

COARCTATION OF THE AORTA is a common cause of congestive heart failure in infants. While the optimal time for surgical correction is during the second decade of life, the authors advocate digitalization and surgical intervention in the infants with acute myocardial decompensation who have had progressive cardiac enlargement and previous episodes of congestive failure due to coarctation.

Two cases are reported, the infants being 18 and 30 weeks of age, respectively, at the time of operation. Both resulted from normal pregnancies and had normal weights at birth. The first infant was hospitalized for otitis media, and subsequent angiocardiography revealed a coarctation of the aorta. Blood pressure in the arms was 140/90 mm. Hg, the liver was enlarged, and the femoral pulses were absent. Excision of the coarcted segment with end-to-end anastomosis of the aorta was accomplished after 45 minutes of lower aortic occlusion.

The second infant had had four previous bouts of decompensation due to minor infections. A fifth episode led to angiocardiographic study with the demonstration of a hypoplastic aortic arch and aortic coarctation. The physical findings were similar to, but more severe than, those in the first case. At operation, hypothermia (88 to 94° F.) was employed. The ligamentum arteriosus had a tiny lumen and there was a dilated segment distal to the true coarctation. Resection was accomplished and an anastomosis 7 mm. in diameter was made.

In both cases femoral pulses appeared promptly after surgery and the convalescences were normal. The infants have shown general improvement in the follow-up period of approximately 4 months. In both, however, the blood pressure has been only slightly reduced. Further study will evaluate growth changes in the aorta at the anastomotic sites.

—*Emile L. Meine, Jr., M.D.*

Surgical Treatment of Coarctation of the Aorta; Further Experiences with the Use of the Subclavian Artery. HARRIS B. SHUMACKER, JR. *Am. J. Surg.*, 1955, 89: 1235.

THE IDEAL METHOD of treatment for coarctation of the aorta is excision of the coarctation with end-to-end aortic anastomosis. Occasionally, because of atypical location of the coarctation, rigidity of the aortic wall, unusual length of the area of coarctation, or the presence of an aneurysm, it is impossible to accomplish an end-to-end aortic suture. Such cases can be managed in a number of ways, viz., with the use of homologous aortic grafts, plastic tubes, or by end-to-side subclavian-aortic by-pass.

Since the subclavian artery is almost invariably enlarged in cases of coarctation, end-to-side anastomosis is not necessary; instead the subclavian artery can usually be sutured end-to-end to the distal aorta. Neither end-to-side nor end-to-end anastomosis proved entirely successful, since a high incidence of unsatisfactory restitution of good aortic pathway and reduction in blood pressure occurred. The author had two such disappointing results.

The author has had more encouraging results by cutting across the subclavian artery tangentially in a plane parallel to the long axis of the body, rather than by transection at a right angle. This modification decreases the likelihood of buckling and permits a large subclavian stoma for anastomosis. The subclavian artery is ligated distally, clamped, and divided. It is held out in the axis of the arch of the aorta and depressed sufficiently to meet the end of the descending aorta. An opening of suitable size is made in the inferior aspect of the subclavian and side-to-end anastomosis with the aorta is then carried out. The remainder of the subclavian artery is amputated beyond the site

of anastomosis and closed with sutures. The author has treated 3 patients in this manner with very good results.

The author, in a previous communication, suggested that the subclavian artery may be used as a free autogenous graft to bridge a defect in the region of the first portion of the descending thoracic aorta. The subclavian artery is transected at its point of origin in a plane parallel to the long axis of the body and resutured to the end of the arch of the aorta so that the subclavian points caudally instead of in a cephalad direction. The author also suggested that under certain circumstances a free graft of the subclavian artery might be interpolated between the proximal and distal segments of the descending aorta. He has used this method successfully on one occasion.

It is agreed that the best method of treatment is excision of the area of coarctation and end-to-end restoration of continuity of the divided aorta, or in case the area of coarctation is situated at the base of the subclavian artery or at the base of the aorta, by division and anastomosis of the distal aortic segment to the base of the subclavian artery. Such procedures are feasible in the majority of instances. Cases in which these ideal methods are not applicable are encountered more commonly among older children and adults than among younger children.

Careful extensive mobilization of the aorta, subclavian artery, and distal end of the aortic arch often makes it possible to accomplish this objective. On occasion such a direct restoration of aortic continuity cannot be achieved. Some of these cases require the use of a preserved aortic graft or of an inert plastic tube. A number of these, however, can be managed successfully by the use of the subclavian artery. The author believes that simply turning down the subclavian artery for end-to-end anastomosis with the distal arterial segment is not satisfactory. He outlines three modifications which render use of the subclavian satisfactory. —*Robert Paradny, M.D.*

Studies in Coronary Occlusion with Particular Reference to the Lack of Effect of Experimentally Produced Myocardial Infarction upon Exercise Tolerance. Harry Siderys, Harris B. Shumacker, Jr., and Angelo Riberi. *Surgery*, 1955, 37: 890.

The principal object of this study was to learn whether dogs with experimentally produced myocardial infarction have an objectively measurable decrease in exercise tolerance which would serve as a valid basis for evaluating the efficacy of procedures designed to bring about revascularization.

Thirty healthy mongrel dogs weighing between 10 and 20 kgm. were trained to run on a horizontal treadmill until they ran quite willingly and without balking. Animals that would not co-operate were excluded from the study. Each dog was run at a uniform speed until he was obviously exhausted, and the speed of the treadmill and duration of the physical effort were recorded. Each of the dogs which survived coronary artery ligation was again run on the treadmill at the same speed one month after operation. The criteria for exhaustion included extreme tachypnea, cyanosis of the tongue, and obvious attempts to escape from the treadmill. It was obvious that the last point was not as sharp as might have been desired. It was felt, however, that comparative data were valid in view of the fact that only co-operative, trained animals were used and that all the training and testing were done by one individual.

The animals were operated upon and the bifurcation of the left coronary artery was dissected free. The anterior descending branch was divided at its origin between two fine silk ligatures. The pericardium was sutured together, and the chest was closed in layers with interrupted silk sutures.

Of the 30 dogs operated upon, 18 died in from one minute to 10 days after ligation, an over-all mortality of 60 per cent. Sixteen of the 18 dogs that died did not live as long as 24 hours. All those that survived longer than 10 days remained healthy. They were sacrificed from 31 to 71 days after operation. A large infarct involving the anterior surface of the left ventricle was present in every animal.

Exercise tolerance studies revealed no significant difference between the preoperative tolerance as measured by treadmill studies and the tolerance observed one month after ligation of the coronary artery. Seven dogs performed better before ligation, although the differences were rather insignificant.

It was disappointing to learn that no constant and significant decrease in exercise tolerance follows the experimental production of large myocardial infarcts. Even though the methods do not precisely simulate the situation in which they might be used in man, they do, nevertheless, provide valuable information concerning their effect upon the myocardial circulation. In the final analysis the value of any proposed surgical aids must of necessity be established or refuted by carefully controlled observations in man. —*Stephen A. Zieman, M.D.*

ESOPHAGUS AND MEDIASTINUM

Reflux Esophagitis. John D. Stewart, William M. Chardack, and Guy S. Alfano. *Ann. Surg.*, 1955, 141: 627.

During the past 5 years the authors have treated 66 patients who had reflux and peptic esophagitis. The term "reflux esophagitis" is chosen as more inclusive of diseases of the lower esophagus associated with the reflux of either peptic or alkaline juice into the lower esophagus. It is also probably true that some instances of peptic esophagitis occur in the absence of gastric reflux, due to the malposition of gastric mucosa in the lower esophagus. In 42 of the 66 patients a sliding hernia was evident. In 28 of the patients there was clinical data which suggested that a duodenal ulcer was, or had been, present. The various etiologic factors encountered in reflux or peptic esophagitis were:

1. Incompetence of cardioesophageal sphincter mechanism: (a) with sliding hiatal hernia; (b) after surgical operation
2. Gastric hypersecretion and the peptic ulcer diathesis
3. Protracted vomiting, nasogastric intubation, pyloric obstruction
4. Ectopic gastric mucosa, as "short esophagus," or scattered islets
5. Individual susceptibility

The age of the patients was found to vary from birth to 91 years, and the length of time symptoms had been present varied from a very short duration to as many as 20 years. The usual event which brought the patient to seek surgical relief was either hemorrhage or esophageal obstruction.

The symptoms of reflux esophagitis are heartburn, retrosternal distress, dysphagia, regurgitation of food, and bleeding into the upper gastrointestinal tract. Many of the patients who come to the attention of the gastroenterologist can be treated on a medical regimen, with esophageal dilatations if necessary.

The indications for sugery are: (1) failure of relief of symptoms by medical treatment; (2) progression of the esophageal inflammation and deformity; (3) hemorrhage; and (4) esophageal obstruction.

The authors point out that postulcerative fibrotic changes in the lower esophagus and mediastinum are far more serious than in the stomach or duodenum. Consequently, evidence of progression of reflex esophagitis calls for surgical treatment without further procrastination.

The aims of surgical treatment are:

1. Prevention of reflux of digestive secretions, either gastric or upper intestinal, into the esophagus.
2. Promotion of rapid drainage of the esophagus and the part of the alimentary canal into which it empties.
3. Reduction of gastric acidity to a low value, or production of anacidity.
4. Relief of esophageal obstruction.
5. Exclusion of the possibility of neoplasm of the esophagus, if this is in question.

With these aims in mind, the preferential surgical approach is a left thoracoabdominal incision. Occasionally, if the stenosis of the esophagus is high, a right thoracoabdominal approach may be considered desirable.

The authors believe that there is little place for the performance of a Heineke-Mikulicz type of esophagoplasty alone in the treatment of stenosis of the esophagus. If reflux esophagitis is unrelieved by nonsurgical measures and accompanies a sliding hiatal hernia, gastric resection is the best therapeutic approach. A most perplexing problem to the surgeon is the restoration of gastrointestinal continuity following resection of an esophageal segment for esophageal stenosis. The authors agree with Sweet in that the most satisfactory plan is resection of as much of the proximal stomach as possible, but with enough distal stomach left to bring into the chest for esophageal anastomosis. Pyloroplasty is added to the proximal gastric resection to promote rapid gastric emptying.

The authors report 7 illustrative cases indicating the general principles which have been outlined. They recommend that remedial surgery, consisting of repair of a hiatal sliding hernia and gastric resection, be performed in appropriate cases before the esophagus has become fibrotic and shortened.

—*Jerry A. Stirman, M.D.*

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Treatment of Recurrent Hernia with Diced Cartilage Grafts (L'innesto di cubetti cartilaginei nella cura della recidiva erniaria). MARIO MASTURZO. *Rass. internaz. clin. ter.*, 1955, 35: 352.

THE SUBJECT of recurrent hernia is reviewed. A case report is presented of a patient with a fourth recurrence of an inguinal hernia. He was treated with diced cartilage grafts used according to the method of Peer. A section of cartilage was removed from the right costal cartilage and cut into 3 mm. cubes. These were placed over the primary plane which was sutured by means of linen suture. The cord was placed over the cartilage cubes and the anterior wall was repaired with catgut. The wound healed per primam. After 6 months follow up examination of the patient showed good healing with no evidence of recurrence.

—Lucian J. Fronduti, M.D.

GASTROINTESTINAL TRACT

On the Gastroesophageal "Sphincter" and the Mechanism of Regurgitation. PAUL MARCHAND. *Brit. J. Surg.*, 1955, 42: 504.

IN ORDER to account for the functions of the cardioesophageal junction in limiting regurgitation and in delaying the entry of esophageal contents into the stomach, three major theories have been proposed. The distal end of the esophagus possesses sphincteric action even in the absence of a morphologic apparent sphincter. The oblique entry or passage of the esophagus through the diaphragm accounts for a pinch-cock effect exerted on the esophagus by the diaphragm. The esophagus enters the stomach at such an angle that a flap valve is formed with the fundus.

When food or barium is swallowed there may be a temporary arrest of the bolus at the lower end of the esophagus. This bolus enters the stomach more readily during expiration than on inspiration. Although these observations have been said to prove that contraction of the muscular crura of the diaphragm constricts the esophagus, an alternate suggestion is that the pressure differences between the thorax and abdomen are the cause of the delay. During quiet respiration the normal gradient pressure (presuming that intrapleural pressure is transmitted to the esophagus and intraperitoneal pressure to the stomach) is approximately 5 to 15 cm. of water.

In order to test the validity of such a statement several clinical experiments were performed. A high intraperitoneal pressure was simulated by the inflation of a balloon strapped against the abdomen. There is a definite linear correlation between the mean intraperitoneal pressure and the balloon pressure. The following observations were noted:

1. When the balloon is inflated to from 60 to 80 cm. of water a phrenic ampulla is always produced as barium is swallowed.

2. Increasing the pressure in the balloon to greater than 120 cm. of water may prevent the passage of barium into the stomach.

3. When swallowing efforts are made against high intraperitoneal pressures regurgitation from the stomach may occur and the newly swallowed barium may be forced back into the mouth.

4. The subjects frequently complain of dysphagia when attempting to swallow against high intraperitoneal pressure. When forced expiration is carried out against a closed glottis there is an increment both in the intrapleural and the intraperitoneal pressures. The authors determined during a well performed Valsalva maneuver there is a linear correlation between the intrapleural and the intraperitoneal pressures, up to approximately 20 cm. of water, and thereafter there is an inordinate increment in the intraperitoneal pressure, which produces a gastroesophageal pressure gradient of between 30 and 40 cm. of water.

The pinch-cock effect of the right crux of the diaphragm probably does not play a part in the normal delay of food entering the stomach because: (1) the delay in passage is still present even though the phrenic nerve is paralyzed, and (2) with the finger through the hiatus during operations there does not appear to be any pinch-cock effect even though the patient is hyperventilating. The authors believe that the pleural peritoneal pressure gradient may account for the momentary physiologic arrest in the passage of food from the esophagus into the stomach.

In most instances in which a pathologic delay occurs a sufficient pressure gradient cannot be demonstrated. Such an abnormal pathologic state occurs in acute injury to the esophagus and achalasia of the cardia. Of the 158 patients who had caustic soda burns of the esophagus, 92 were admitted to the hospital and a barium swallow was obtained soon after admission. If the motor activity of the esophagus was visibly deranged, this delay could be explained, but infrequently patients who had mild symptoms or mild involvements without motor disturbances were seen. Examination of these people in an erect position showed an accumulation of barium at about the level of the aortic arch, and the barium would then drip slowly into the stomach. Contraction waves would descend from the esophagus to within a few centimeters of the cardia, but never quite reach it. In people who had the most severe type of injury the terminal 1 to 2 cm. of the esophagus were often free of injury, as if the lumen of this segment remained contracted at the time of injury.

The patients who have achalasia of the cardia have a normal pleuroperitoneal pressure gradient. However, there is a prolonged delay at the lower end of the esophagus. The fluid level in the esophagus is usually 15 to 20 cm. above the diaphragm. This height of fluid is just sufficient to overcome the hydrostatic pressure gradient across the diaphragm. Heller's operation, which transects the muscle fibers of the con-

stricted segment, results in symptomatic improvement although there is no change in pleuroperitoneal pressure. If paralysis of the esophageal musculature is the underlying cause of achalasia, then the Heller procedure should not afford symptomatic improvement. The changes in esophageal function in two pathologic states, achalasia of the esophagus and acute caustic soda burns, would tend to indicate that there may be an inherent spincteric function of the terminal esophagus.

The oblique entry of the esophagus into the stomach would seem to act as a flap valve as the stomach distends. In order to test this hypothesis, the pylorus was cannulated in cadavers and a reservoir was elevated until fluid was seen to come from the esophageal opening. With the organs in situ, 28 cm. of water produced reflux from the esophagus. When the fundus of the stomach was excluded by a clamp from the esophagogastric junction to the greater curvature only 9 cm. of water pressure was necessary to produce reflux. The removal of the left leaf of the diaphragm, which in turn allowed the fundus to distend further, brought about an increment in the amount of water pressure necessary to produce regurgitation (42 cm. of water). Abolishing the esophagogastric angle allowed regurgitation at only 3 cm. of water. The position of the stomach, the oblique entry of the esophagus into the stomach, and the position of the surrounding viscera combine to produce a flap valve which tends to limit regurgitation.

Twenty normal young adults were subjected to abdominal compression in a head down position. The stomach was filled by drinking watery barium and the balloon was gradually inflated until regurgitation was seen, or until a pressure of 150 cm. of water was reached. Although the results were extremely variable, several conclusions were reached:

1. The higher the pressure at which reflux was reached, the more forceful was the regurgitation.

2. Whereas 60 cm. of water seldom caused regurgitation, 150 cm. of water usually did so. If regurgitation failed to occur at 150 cm. of water, drinking of additional barium produced a regurgitation so powerful that it forced the barium which had just been swallowed into the mouth.

3. Regurgitation was occasionally seen when an esophageal peristaltic wave reached the cardia.

These observations point out that the force which causes regurgitation is intragastric pressure and the structural arrangement of the esophagogastric junction is reinforced by some active mechanism which can be inhibited by swallowing.

The conclusions reached by the previous experiments point out that the physiological delay to the passage of food from the esophagus into the stomach may be accounted for by the differences in pressure between the thoracic and abdominal cavity. The pathologic delay of food or the bolus which occurs in achalasia of the cardia and in mild cases of acute caustic soda injury would appear to be due to the failure of relaxation of the terminal esophagus in the face of an oncoming peristaltic wave. The regurgitation which occurs from the stomach into the esophagus is prevented by the oblique entrance of the esophagus into the stomach and is probably reinforced by the resting muscle tone of the terminal esophagus. The tonic closure of the esophageal gastric junction is inhibited by swallowing and by the arrival of a peristaltic wave into the lower esophagus. High intragastric pressures may overcome the resistive mechanism at the moment of swallowing and thus permit regurgitation. It is contended that the diaphragm cannot constrict the terminal esophagus and that it plays no part in preventing regurgitation.

Three major mechanisms seem to play a part in gastroesophageal regurgitation: (1) the increase in the intragastric pressure, (2) loss of the normal esophageal gastric angle, and (3) inhibition of the tone of the terminal esophagus.

Increases of the intragastric pressure may result in either passive or active regurgitation. Passive regurgitation is said to occur when sudden increments in intragastric pressure are produced by extrinsic factors, chiefly changes in posture or pregnancy. Active regurgitation is attended by an increase in the intragastric pressure produced by active contraction of the stomach—vomiting. The remainder of the discussion centers around intermittent gastroesophageal reflux seen in adults without nausea and predominantly in response to a passive increase in intragastric pressure.

The classic feature of sliding hiatus hernia is disruption of the esophagogastric angle. Evidence that the esophagogastric angle is of paramount importance is shown by the fact that reflex does not occur in a paraesophageal hernia in which the esophagogastric angle is undistrubed.

The importance of inhibition of the tone of the terminal esophagus is attested by the following circumstances: 4 patients who had perforations of the esophagus (terminal esophagus intact) were noted to have regurgitation through the intercostal catheter only when swallowing.

The symptoms of passive regurgitation are flatulence, fluid regurgitation, and pain. The choking or burning pains of esophageal origin are occasioned when esophageal distention occurs. As noted on barium swallow examinations, this occurs maximinally when swallowed barium meets regurgitated barium and distention persists for some time. A burning pain may be also produced by the swallowing or regurgitation of surface irritants (liquor, gastric acid, caustic soda).

The causes of symptomatic esophageal regurgitation were studied on the basis of questions answered by 19 patients admitted to the unit with a diagnosis of hiatus hernia, 22 physicians who had experienced symptoms of regurgitation, and 250 pregnant women. The following list of causes could be called also the causes of heartburn.

1. Occasional reflux dyspepsia commonly occurring following dietary indiscretions. These attacks usually occur within an hour after taking the offending food and may be precipitated by changing the position. Most attacks subside although only temporarily following the use of antiacids. The few attacks which have been investigated by barium swallow demonstrated a delay in emptying and may represent pyloric spasm which causes the increase in intragastric pressure to be unduly responsive to intrinsic and extrinsic factors.

2. Adiposity. Fat people are subject to attacks of reflux dyspepsia particularly if the weight gain has been rapid. Weight reduction will prevent the tendency toward dyspepsia.

3. Cholecystitis and duodenal ulcer.

4. Air swallowing. Although air swallowing is said to be a functional symptom, it is unfair to label all air swallowers neurotics as most individuals obtain some relief from the swallowing of air.

5. Pregnancy. Approximately 70 per cent of the pregnant women experienced heartburn while they were in the hospital. Only 2 of 3 women complained of symptoms when not pregnant. The symptoms usually began after the fifth month and the discomfort was increased by bending (polishing floors, gardening) and lying down at night. Approximately 50 per cent had discomfort and took antidotes regularly. (The authors point out that this symptomatic regurgitation is probably the result of diminished capacity and the subsequent rise in intragastric pressure.)

6. Hiatus hernia. Because of the alteration in the gastroesophageal angle, reflux is produced whenever the gastric pressure is increased. Regurgitation may occur when the stomach is full or empty and the lower esophagus is then almost continually bathed with gastric content.

Conclusions. Symptomatic regurgitation is usually associated with one or more of the following conditions: (a) a change in posture, (b) gastric distention, (c) diminished peritoneal capacity, and (e) loss of the normal gastroesophageal angle. The more persistent the regurgitation, the more severe are the symptoms. The intensity of the symptoms depends simply upon the effects of prolonged irritation in the esophageal mucosa. —*Jerry A. Stirman, M.D.*

Lye Corrosion of the Stomach and Its Comparison with Gastric Peptic Ulcer (Die Laugenveraetzung des Magens und ihr Vergleich mit dem peptischen Magengeschwuer). A. PROPST. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 353.

THE PATHOLOGICAL CHANGES in the stomach occurring at various stages following lye corrosion are reported. These observations are based on the findings in 11 postmortem examinations carried out from 3 days to 1.5 years after poisoning. The early, acute stage is characterized by liquefaction necrosis of the gastric lining, often extending to the depth of the serosa. Sloughing away of the necrotic tissue follows from the end of the first week to the beginning of the second week, and results in surface defects and ulceration which in general show a good healing tendency.

The later stages with definite mucosal defects differ from typical peptic ulceration in several respects. The lesser curvature and pars pylorica are less prone to be involved than the posterior wall of the corpus. The form of the defects, in contrast to the round form of peptic ulceration, is spread out surface-wise with maplike borders or with a streetlike arrangement. The necrotic streaks characteristic of the peptic ulcer bed are lacking, and regular layers in the ulcer bed cannot be identified. Eosinophile leucocytes in the ulcer bed are lacking. There is also a tendency toward rapid healing with distinct mucosal and epithelial regeneration from the margins, even without significant scar.

On the basis of these observations it appears that a gastric mucosal defect will not become a typical peptic ulcer in the presence of normal gastric juice. It would appear rather that chronic peptic ulceration occurs only in the presence of gastric juice of abnormal composition.

A late result in one case of suicide was a fist-sized shrunken stomach practically devoid of mucosa. In 2 cases pyloric stenosis developed. Premortem perforation of the stomach was not observed and in no case was there evidence of overflow of the lye into the duodenal bulb. —*John L. Lindquist, M.D.*

Basal Cell Epithelioma of Adamantinoid Evolution Originating in the Stomach (Su una singolare neoplasia dello stomaco: epitelioma baso-cellulare ad evoluzione adamantinoide). GIUSEPPE VANGELISTA. *Arch. ital. mal. app. diger.*, 1955, 21: 139.

THE AUTHOR reports the case of a male patient, 49 years of age, who was operated upon for carcinoma of the stomach. At operation a prepyloric tumor was found. A 50 per cent gastric resection was performed with an antecolic anastomosis. The pathologic report was basal cell epithelioma of adamantinoid evolution. This is intended to define a neoplasm which has characteristics in common with basal cell epithelioma and adamantinoma.

The patient was followed up for 2 years during which he was in good health with a good appetite and a weight gain of 7 kgm.

A review of the literature follows. The tumor is considered rare. Its prognosis is very good and metastasis is very seldom seen. —*Lucian J. Fronduti, M.D.*

Seventy-Five Cases of Carcinoma of the Esophagus and Cardia, with a Consideration of Fundectomy (Erfahrungen an 75 Faellen von Oesophagus-Kardiacarcinom unter Beruecksichtigung der Fundektomie). H. KARCHER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 408.

RADICAL OPERATION with exploration of the thoracic and abdominal cavities whenever possible in carcinoma of the esophagus and cardia, and simultaneous removal of the periesophageal, gastric, and pancreatic lymph glands and retrogastric lymph nodes in the hilus of the spleen, the hepatogastric ligament, and, when in doubt, the spleen and parts of the pancreas was carried out on 64 men, and 11 women, whose ages ranged from 38 to 72, with 68 cancers of the cardia and 7 of the lower part of the esophagus. Distally, resection was carried out with a view to radical extirpation of the tumor and retention of as much as possible of the antrum and the pylorus. The only contraindications to this procedure were severe heart disease, circulatory and kidney disturbances, advanced changes in the blood vessels, and proved distant metastases.

Of the 51 patients (68%) that survived the operation, 27 died within 3 years; the others remained symptom-free for periods ranging from 1 to 6 years. These results correspond to those found in the world literature. The most common cause of death was local recurrence of the cancer, which also happened in those who were reoperated upon. The highly differentiated adenocarcinomas showed fewer recurrences than the

other types. The peculiar course of the lymphatics of the esophagus, which course deep in the layers of the mucosa, run for long distances in the submucosa, and then break through the muscular layer into the adjoining glands, accounts for the recurrences.

The life expectancy of patients not operated on is short; in one reported series of 91 patients only 5 lived more than 6 months. Newer techniques which allow more extensive tumor resection with the draining lymphatics and the retrogastric fat tissue, together with the decrease in the postoperative lethal complications because of improved preoperative and postoperative care, allow the recovery rate to reach that of cancer of the lung. The restoration of continuity of the digestive tract avoids the psychic trauma of peroral feeding, the patient often retaining the illusion of a cure to the end.

Resection offers the only chance of cure, although in only a small percentage of cases. Even with nonradical procedures freedom from symptoms lasting many years often follows. X-ray and radium therapy are contraindicated because of the inherent danger of perforation into the mediastinum.

—*Sidney Smedresman, M.D.*

Gastric Leiomyosarcoma (Le leiomyosarcome de l'estomac). FERNAND HIRSCH, MARCEL DESCHREYER, ANDRÉ LEEMPOEL, and CLÉMENT VERHULST. *Acta gastroenter. belg.*, 1955, 18: 264.

GASTRIC leiomyosarcoma is a mass which hemorrhages, but the general condition of the patient is good.

The reported incidence varies from 0.5 to 1 per cent of all gastric tumors.

The tumor, usually in the left hypochondrium, is apt to reach a large size before it gives rise to symptoms. The severity of the bleeding may range from occult to severe. Pain may be dull or intense, or it may be completely absent. Dysphagia and vomiting are rare because the tumor seldom involves the orifices of the stomach. It may ulcerate and thereby cause a fever and leucocytosis. It does not affect the gastric acidity.

Roentgenograms show an external pressure defect in the case of a tumor growing exogastricly, or an intrinsic defect when the tumor is intramural or intraluminal. A sinus extending into the tumor, if visualized by the x-rays, is very characteristic. The gastric wall remains pliable and the peristalsis is usually normal.

Metastases occur late and are not widespread.

The tumor is radioresistant, and its treatment is surgical. The prognosis is better than that for carcinoma —more than half of the patients are living several years after resection. —*Leonid S. Cherney, M.D.*

"Monobloc Resection" of Extensive Gastric Carcinoma (Zur "Monobloc-Resektion" ausgedehnter Magencarcinome). WOLFGANG KÖLE. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 397.

A MONOBLOC RESECTION for extensive gastric carcinoma encroaching on the pancreas and spleen is reported. The procedure was carried out in 3 cases with normal recovery following. The advantage of the procedure is that it is carried out from the left inward with mobilization and removal of the stomach, spleen, and pancreas in one mass, avoiding implantation metastases and removing the lymph bed intact.

The abdomen is explored through a curved, transverse, upper abdominal incision which is extended through the seventh intercostal space and diaphragm. After evaluation of the anatomical situation the greater and lesser curvatures are freed, the greater omentum being removed with the mass. Then with the left hand the spleen and stomach are lifted upward and the phrenicocolic ligament is cut. By sectioning adhesions the spleen, tail of the pancreas, and stomach are delivered from the left upward and medially without disturbing the connections between them. The splenic vessels are ligated and sectioned from behind, the vein distal to its junction with the inferior mesenteric vein. The pancreas is sectioned, and its stump and duct are closed and buried in the retroperitoneal space. According to the site of the carcinoma, the antrum is sectioned and the distal end is closed in 3 layers. By traction on the mass with a wet towel the esophagus can be mobilized and the posterior layer of the serosal sutures between esophagus and anterior wall of the antral stump are placed. The mass can then be removed en bloc and the end-to-side anastomosis is completed between the esophagus and antrum. In the event that total extirpation of the stomach is necessary an end-to-end esophagoduodenostomy or an esophagojejunostomy is done.

—*John L. Lindquist, M.D.*

Treatment of Delayed Emptying by Means of a Duodenal Tube Following Gastric Resection (Sul trattamento incruento dei ritardi di canalizzazione dopo resezione gastrica mediante sondino digiunale). UGGERI CARLO and UGGERI BRUNO. *Bol. Soc. piemont. chir.*, 1955, 25: 324.

THE AUTHORS report 3 cases of delayed emptying following gastric resection. A Camus duodenal tube or ordinary duodenal tube with an olive tip was passed into the efferent loop usually without difficulty. Liquids and gastric aspirations were then introduced into the tube. Canalization was re-established in 29, 21, and 4 days, respectively, after the introduction of the tube. There was no further discomfort. By following this routine the condition of patients with a functional block will be improved, and if the block should be mechanical then surgical reintervention will be necessary. In this way patients will be in better condition for surgery. Among several hundred cases of gastric resection only 2 were encountered in which surgical correction was necessary.

—*Lucian J. Fronduti, M.D.*

Evaluation of Various Operative Methods of Total Gastrectomy (Die Beurteilung verschiedener operativer Methoden fuer die totale Gastrektomie). KOMEI NAKAYAMA. *Chirurg*, 1955, 26: 266.

WITHIN A 4 YEAR PERIOD the author performed 263 total gastrectomies, 251 of which were done on account of carcinoma while in the remaining 12 cases an ulcer was present.

Various methods of total gastric resection can be divided into 3 groups: esophagoduodenostomy, interposition of a jejunal segment between the esophagus and the duodenal stump, and esophagojejunostomy.

The first method, employed only if there is no extensive invasion of the esophagus by malignancy and

if the duodenum can be sufficiently mobilized, was used in 139 cases with a postoperative mortality of 2.2 per cent.

Although the technique of the second method is rather complicated, the procedure is the method of choice if a considerable portion of the esophagus is involved. The transplanted intestinal segment takes over the gastric function and directs the food toward the duodenum. This "physiologic total resection" was performed 71 times without any fatalities.

The disadvantage of the last method lies in the fact that the duodenum is by-passed by the food. This operation was performed on 48 patients with a 2 per cent mortality.

The author stresses the importance of supportive sutures between the diaphragm and the pancreatic capsule to reduce the tension on the direct esophagoduodenal anastomosis. If esophagojejunostomy is performed, similar sutures are placed between the diaphragmatic crura and the posterior wall of the jejunum. In both types of operation 2 layers of sutures are used. The outer layer unites the intestinal serosa with the diaphragmatic crura. Seromuscular sutures, especially on the anterior side of the anastomosis, are not recommended.

There were no marked differences between the 3 surgical procedures as far as the degree of postoperative shock, the length of hospitalization period, and survival were concerned.

The blood losses were smallest after esophagoduodenostomy and largest after interposition of the intestinal segment, but the differences were not clinically significant. Liver function tests showed that the least untoward effect followed esophagoduodenostomy.

Postoperative stenosis at the site of the anastomosis was observed in 56.7 per cent of the cases after esophagoduodenostomy, in 88.9 per cent after interposition, and in 62.5 per cent after esophagojejunostomy. The occurrence of postoperative strictures can be limited by a perpendicular incision of the diaphragm. Painful deglutition after the operation is attributable to a stricture or a recurrence of carcinoma.

Postoperative esophagitis with resulting heartburn, caused by the reflux of bile into the esophagus, was observed most frequently after esophagojejunostomy and could be relieved by the intake of an acid. Diarrhea occurred in one-third of all the patients who had undergone esophagojejunostomy.

Anemia, more frequent after esophagojejunostomy than after the two other types of operation, is ascribed by the author to a deficient resorption of iron.

A grave impairment of the resorption of fats, carbohydrates, and proteins followed gastrojejunostomy.

The greatest gain in weight was recorded after the interposition operation.

A relatively small carcinoma in the region of the antrum or pylorus is not considered an indication for total gastrectomy.

The survival period in a group of 157 patients was 6 months in 69.4 per cent, one year in 34.3 per cent, and 3 years in 15.8 per cent.

The interposition operation should be employed whenever the patient's condition allows it. Esophagojejunostomy furnishes the poorest results.

—*Joseph K. Narat, M.D.*

The Dietary Control of the Postgastrectomy "Dumping Syndrome." MARK A. HAYES. *Surgery*, 1955, 37: 785.

FOLLOWING GASTRIC RESECTION, approximately 11 per cent of the patients experienced distress after eating. It has been demonstrated that when the pyloric antrum and proximal duodenum are removed, delay in gastric emptying caused by the presence of fat is no longer observed. It is important to note that clinically, in patients partially gastrectomized, there is a failure to gain weight. This report discusses the ease with which both the dumping syndrome and suboptimal weight complex can be managed by proper supervision of the total caloric intake, and the importance of the fact that the source of these calories be protein, carbohydrate, and fat.

The severe symptomatic complex that occurs after gastric resection can be explained as follows. The oral administration of hypertonic glucose, saline solution, or protein hydrolysates to these gastrectomized patients will produce an immediate increase in jejunal motility. Within 10 minutes following the administration of such materials there occurs a progressive decrease in plasma volume and hemoconcentration which lasts about 20 to 30 minutes. This is followed by an increase in plasma volume and hemodilution which reaches a maximum in 70 to 80 minutes. The clinical symptomatology of the dumping syndrome is produced simultaneously in most cases. An ordinary diet in these patients provides a mixture of food with readily hydrolysable components which upon digestive hydrolysis produce a hyperosmolar mixture in the proximal small bowel. This is readily accomplished because the restraint to rapid gastric evacuation is missing.

The hyperosmolar mixture is rapidly rendered isotonic by the withdrawal of water from the circulating blood, producing an acute reduction of the effective circulating blood volume and the concomitant symptoms of a vasomotor shocklike complex, which is characterized by tachycardia, palpitation, perspiration, dizziness, and nausea. Often a severe diarrhea occurs after the ingestion of food. Nutritional deficits following gastric resection arise from the same etiological mechanisms but may range from severe symptomatology to an asymptomatic failure to gain weight.

The clinical material reported was based on a study of 7 cases, all males suffering from various degrees of a postgastrectomy "nutritional deficit syndrome." The patients were hospitalized for the correction of the nutritional deficit. The therapeutic diet in the hospital contained twice the amount of previous caloric intake and a large amount of fat. During hospitalization a diet suitable to each individual was developed within the framework of therapeutic requirements. The patient learned the diet which was to become part of his pattern of living after discharge from the hospital. Careful measures of the calories offered, calories consumed, and calories lost were recorded, and it was found that a satisfactory correction of the nutritional difficulties was obtained by diet. A diet of high fat and high protein content (slowly hydrolysed) could be fed with a maximum exclusion of carbohydrates, which are easily hydrolysed. A satisfactory diet was one with caloric ratios from carbohydrates, protein, and fat, respectively; 1, 1.5 and 5.

It was suggested that because of the high incidence of nutritional problems after gastrectomy, dietary advice be given to such patients when they are discharged from the hospital after operation.

—*John E. Karabin, M.D.*

The Pathogenesis and Prophylaxis of the Peptic Jejunal Ulcer (Zur Entstehung und Verhuetung des Ulcus pepticum jejuni). FRITZ DEMMER. *Klin. Med.*, Wien., 1955, 10: 234.

THE AUTHOR, who is a professor of surgery in Vienna, gives at first a brief outline of the trends and results of surgery in gastric and duodenal ulcers in the past 35 years. The original enthusiasm for resection for the prevention of jejunal peptic ulcers has not lasted. One of the reasons for abandoning gastroenterostomy was the 2 per cent incidence of jejunal ulcer following this operation. Now the over-all incidence after resection is also 2 per cent, and in some statistics even higher.

None of the many theories on the pathogenesis of peptic jejunal ulcer is satisfactory to the author, but he believes that Denk's explanation stands on firm ground—digestion of the mucosa cannot take place unless it has been damaged in the first place. It is this primary damage that the article is concerned with. In the author's view the ulcer in the line of anastomosis has a different etiology than that of an ulcer in the jejunum itself.

In anastomotic ulcers the fact that unresolved catgut has been found by the author and others in relaparotomized patients as long as 1.5 years after the original procedure, and that interrupted mucosal catgut sutures are released into the intestinal lumen later than are silk sutures, makes the value of catgut (and particularly of continuous suture) questionable. Furthermore, the suture technique seems of utmost importance. The author, who uses Hochenegg's two-row technique, operated on 2 patients for jejunal ulcer, on whom he had done the original anastomosis. In both there was a large ulcer in the posterior line of anastomosis, in the base of which was a silk suture visible from the lumen. This undoubtedly came from the serosal layer. In his opinion, the suture had produced the ulcer as it had formed a tiny abscess in the tissue "cuff" which broke into the lumen.

The fact that most of the anastomotic ulcers are in the posterior line of anastomosis supports this view, since with the ordinary technique the knots come to lie in the cuff. A new technique is therefore advocated for both posterior and anterior lines of anastomosis, by which the knots of the serosal layer become everted, and the knots of the mucosal layer are inverted so that they come to lie in the lumen.

Several factors contribute to the development of the jejunal ulcer opposite the anastomosis: (1) rapid emptying of the stomach which causes an injurious impact on the jejunal mucosa, dilatation and distal contraction of the jejunum, and (2) unhygienic eating habits (food taken too hot, cold, or fast—insufficiently chewed). The author prefers a small stoma of 2.5 cm. to control the dumping as much as possible.

Prophylactic measures include preoperative gastric lavage with diluted hydrochloric acid for bactericidal purposes, avoidance of continuous suture, eversion of serosal, and inversion of mucosal knots, small anastomoses, preoperative sanitation of the teeth, and education of the patient regarding his eating habits.

—*Fritz H. Moser, M.D.*

The Pathogenesis and Surgical Treatment of Peptic Jejunal Ulcer (Ueber die Pathogenese und die chirurgische Behandlung des Ulcus pepticum jejuni). E. LIGDAS. *Chirurg*, 1955, 26: 247.

THE MAIN FACTOR in the pathogenesis of peptic jejunal ulcer is the failure to remove the antral mucosa. Trauma by intestinal forceps or heavy suture material, and circulatory disturbances represent additional factors.

In the author's series of 169 peptic jejunal ulcers, 79 developed after anterior gastroenterostomy, 74 after the posterior type of the same operation, 2 after the Billroth I operation, 12 after the Billroth II procedure, and 2 after Finsterer's resection for exclusion.

In 160 of the 169 patients with a peptic jejunal ulcer, a radical Billroth II operation was performed, while in the remaining cases the Billroth I procedure, simple suture of a perforated ulcer, or only exploration, on account of poor condition of the patient, was done. As a rule, after resection of the stomach including the anastomosis the continuity of the bowel was re-established by an end-to-end jejunojejunostomy, the upper two-thirds of the proximal end of the stomach were closed in 3 layers, and a retrocolic end-to-side gastrojejunostomy completed the operation.

In selected cases in which no definite ulcer could be demonstrated, although a delayed emptying of the stomach was present, the anastomosis was taken down and the defect in the jejunum was closed in 3 layers without resection of the gut. The results were good. In elderly patients with a high posterior gastroenterostomy and without a demonstrable ulcer the anastomosis was left intact, but the antrum was resected.

In 25 cases no jejunal ulcer could be found at operation although the preoperative diagnosis was confirmed by roentgenologic findings. In these cases the microscopic examination revealed gastritis, duodenitis, or jejunitis.

The mortality after radical operation was 10.65 per cent. The author noticed that patients with hyperacidity developed symptoms of a jejunal ulcer soon after the first operation, while the interval between the latter and the second operation was much longer in patients with normal acidity or hyposecretion.

—*Joseph K. Narat, M.D.*

The Treatment of Perforations of Gastric, Duodenal, and Jejunal Ulcers (Remarques sur le traitement des ulcères gastro-duodé naux et jéjunaux perforés). F. SAEGESSER. *Lyon chir.*, 1955, 50: 426.

THE AUTHOR favors a gastric resection at the time of emergency laparotomy for perforation of gastric, duodenal and jejunal ulcers. Because of the severity of the symptoms, the patients are usually seen early, and the average time interval between the perforation and the operation was 5 hours. The radical procedure has the advantage of subjecting the patient to only one operation, and treats both the acute complication and the underlying disease at the same time.

The author has been able to carry out a resection in 79 of 93 perforations (85%), with only one death and no incidence of subdiaphragmatic abscess.

The low mortality combined with definitive treatment of the ulcer makes this form of therapy much preferable to a simple closure of the perforation and to the risky conservative treatment with continuous gastric suction. —*Leonid S. Cherney, M.D.*

The Diminishing Mortality from Appendicitis. JAMES R. CANTRELL and EDWARD S. STAFFORD. *Ann. Surg.*, 1955, 141: 749.

THE RESIDUAL MORTALITY from appendicitis is determined by the incidence of perforation. Unperforated appendicitis carries virtually no mortality.

Good general care is the most important element in the treatment of appendiceal perforation. Antibiotics are only an important addition to the other therapeutic measures.

Reduction of the mortality from appendicitis is primarily dependent upon the prevention of perforation. This, in turn, is dependent upon improved education among both physicians and laymen. The patient must be impressed with the importance of early and accurate diagnosis of abdominal pain.

The removal of a significant number of normal appendices is entirely justified in the effort to eliminate perforation so long as the highest standards of diagnostic endeavor are maintained.

—*Samuel Kahn, M.D.*

Perforation of the Rectosigmoid Colon on the Basis of an Effort (Les perforations par effort du côlon rectosigmoïdien). M. P. BIRBIS. *Bordeaux chir.*, 1955, p. 17.

THREE INSTANCES of perforation of the rectosigmoid colon on the basis of an effort from the author's personal experience are reported. A similar instance reported by Weinstein and Roberts is appended. All of the patients were males and in each instance the effort consisted in straining at stool, but in no instance had there been any gastrointestinal symptoms indicative of general or local disease of the rectosigmoid (diverticulum, ulcer, vascular anomaly) to provide an etiologic clarification of the accident. The ages of the patients were 28, 69, 52 and 63 years, respectively. In all of the patients the onset was sudden with knifelike pains, followed by the symptoms of a more or less generalized peritonitis. In 3 instances there was a rounded perforation on the anterior, or free surface of the sigmoid shortly above the point of junction with the rectum. In 2 instances a fecaloma was present in the pouch of Douglas; in the patient of Weinstein and Roberts there was reported to be abundant feces and gas in the peritoneal cavity. In the remaining patient the perforation was almost circular, only a small strip of the posterior wall remaining intact. In this instance there was an intestinal neoplasm (Lieberkühn type) a short distance above the point of perforation and the patient was also suffering from a malignant lingual neoplasm.

In 3 of these instances 2 rows of invaginating sutures were used to close the intestinal perforation and a careful toilet of the peritoneum was carried out. An artificial anus was established in the left iliac region; penicillin and streptomycin solutions were placed in the peritoneal cavity, and antibiotic therapy was administered during the convalescence. All of the patients recovered from the sigmoidorectal accident.

The third of the author's patients was operated on because of the presence of a tumor by the Hartmann method of intestinal excision, and the specimen exhibited, other than the neoplasm, no evidence of a diverticulum, ulceration, infective manifestations, or vascular anomalies in the removed specimen. This patient later died of the malignant process in the tongue.

In an attempt to make an etiologic and pathogenetic hypothesis to explain these otherwise unexplained accidents, the author recalls that all of these patients gave a history of obstinate constipation, and that Quenu and Duval postulate a weakness of the wall of the sigmoid at exactly the point where these perforations occurred. He therefore suggests that the constant strain in attempting defecation may have produced a hernial weakness in the free portion of the wall of the sigmoid, resulting in a deposition of fecal material (fecaloma) at this point. The intestinal wall thus became extremely thin and finally ruptured during the straining at stool. —*John W. Brennan, M.D.*

Carcinoma of the Colon in Chronic Ulcerative Colitis. I. GELBER, HERBERT R. HAWTHORNE, and ALBERT GELB. *Gastroenterology*, 1955, 28: 836.

THE INCIDENCE OF CARCINOMA of the colon in the normal population is reported to be 0.02 per cent. The over-all incidence of carcinoma of the colon in chronic ulcerative colitis is variously reported between 3.9 and 11 per cent. Of greater importance, the incidence of carcinoma in long-standing cases of ulcerative colitis is reported as high as 36 per cent; the carcinoma is highly malignant, and the survival rate is low after resection.

Differences of opinion exist concerning the possible reason for this increased incidence and the relation of pseudopolyps to the etiology of carcinoma in chronic ulcerative colitis. The long-standing theory that the pseudopolyps are premalignant is challenged by many, including the authors who present a case of chronic ulcerative colitis of 15 years' duration. This case illustrates many of the points against pseudopolyps as the cause of the carcinoma and favors several of the more recent theories. Four separate malignant lesions were found; 2 of these were typical adenomatous carcinomas and 2 were highly anaplastic scirrhous carcinomas occurring in the areas of the colon which were badly scarred and "burned out" and with no remaining evidence of polyps. In addition, other areas of the "burned out" portion of the colon showed small clusters of malignant cells within the lymphatics widely separated from the main carcinomatous lesions and from any areas of pseudopolyp formation.

Several theories as to the cause of carcinoma in such cases have been proposed. One is that the malignant lesions occur in pre-existing adenomatous polyps which are known to occur in 5 per cent or more of normal adults. A second is that the pseudopolyps are not likely to be the point of onset of carcinoma as they are simply inflamed, edematous areas of mucosa between ulcerated areas, and the cellular reaction within the pseudopolyps is entirely different than the reaction occurring in adenomatous polyps undergoing malig-

nant change. The carcinoma more likely originates in "burned out" or atrophic areas, like the carcinoma occurring in burn scars, and the site of intense destruction of the mucosa and the equally intense attempt at repair is more likely to be the site of the carcinoma.

—*Frederick C. Hoebel, M.D.*

Results and Experiences in the Surgical Management of Carcinoma of the Rectum (Unsere Ergebnisse und Erfahrungen in der chirurgischen Behandlung des Mastdarmkrebses). WOLFGANG KOLE and FRANZ MISCHINGER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 381.

THE RESULTS of surgical treatment in 290 cases of carcinoma of the rectum are reported. Radical operations were done in 49 per cent and palliative operations in 24 per cent of the patients; 27 per cent were not operated on. The operability rate for the entire group of patients was 49 per cent, but on the basis of the two groups undergoing radical and palliative procedures it was 67 per cent. The factors of age, sex, site of the carcinoma, the histologic findings, and the operative mortality are tabulated. The mortality for the radical operations was 16.9 per cent and that for the palliative operations 25 per cent. The survival rate following the radical operations was 33 per cent at 3 years and 17 per cent at 5 years. For the entire group the survival rate was 11.2 and 8.3 per cent at 3 and 5 years, respectively.

Although a certain individualizing of operative treatment is necessary for carcinoma of the rectum, the authors have tried to achieve some standardization of operative procedures for particular patient groups and indications. These procedures include abdominal resection, abdominoperineal amputation, and abdominosacral amputation.

—*John L. Lindquist, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

An Evaluation of Factors Influencing the Discriminative Effectiveness of a Group of Liver Function Tests; The Utilization of Multiple Measurements in Medicine; Normal Limits of 11 Representative Hepatic Tests; Relative Effectiveness of Hepatic Tests in Cirrhosis. LESLIE ZIEVE and EARL HILL. *Gastroenterology*, 1955, 28: 759, 766, 785.

THE AUTHORS propose the use of analytical statistical methods to enhance the value of multiple clinical tests in medicine. Generally, clinical tests are evaluated individually, but further information and accuracy is available by studying the interrelationship of multiple tests such as are used in obtaining a "liver profile." Thereby, some measurements which may seem significant may prove not to be of much value if studied in relation to other tests, and vice versa. Furthermore, a formula measuring the common aspect of all or of the significant tests done to study a disease may be developed, such as the CAS (cirrhosis abnormality score) developed by the authors. Such a measurement based by formula upon specific tests gives a figure which may be contrasted with the individual tests and may be more significant clinically than the individual tests.

In recent years there has been a rapid development of analytical statistical techniques for handling multivariant data. Three of the simpler of these methods are:

1. Multiple regression, by which method a linear formula may be used, combining several interrelated variable measurements to predict an unknown measurement or criterion with minimal error. By this method certain of the variable measurements can be evaluated as to their individual importance.

2. Multiple covariants, in which, the data are classified into subgroups in some fashion (for example, normal and abnormal subjects); in addition to the relationship of a dependent variable to several associated measurements, the principles of multiple covariance are applied to evaluate the factors influencing the power of the dependent variable to discriminate between the subgroups.

3. Discriminative analysis is used when the criteria are not quantitative but qualitative, as often happens in clinical medicine. A means of predicting qualitative criteria with optimal efficiency from a series of quantitative measurements is desirable. Also a means of determining which of the quantitative measurements are of discriminative value, which are not, and the relative predicted value of the individual measurements is important. A statistical procedure solving this problem has been developed and is called the *discriminant function method*. It is analogous to multiple regression and yields a formula which represents the best possible linear combination of the measurements for discriminating between two groups or in a more complicated way between several groups.

The multivariant techniques and in particular the discriminant function method should improve certain clinical studies in two respects: it avoids generalizations from controlled to uncontrolled circumstances and it utilizes fully the information available in a set of measurements. For instance, in a clinical investigation statistical control of certain variables can replace experimental control, in which latter method the one factor or measurement is kept constant as the other variable measurement is evaluated in relation to it.

Such analytic methods are particularly appropriate in the study of disease of the liver since the liver is a complex organ involved in many metabolic processes for which there are many hepatic tests designed to detect abnormality early in its development. Further tests are constantly being developed, always in an attempt to develop more sensitive ways of determining early liver dysfunction. The logical development of the study would be to inquire into the interdependence among the liver tests and to determine (a) which tests really contribute independent information and (b) the relative magnitude of each test's independent contribution to the detection of abnormal individuals.

Eleven representative liver function tests were selected and performed on 720 healthy gainfully employed males. Approximately one-half of the group had a history of viral hepatitis 4 to 6 years previously; the others were the controls. With one exception these two subgroups had nearly identical frequency distribution for each liver function test being studied. The means and standard deviations corresponded closely. Being indistinguishable, the subgroups were combined

to form the norm group for each test except the zinc turbidity. The infectious hepatitis cases were omitted from the norm group because their average zinc turbidity was significantly higher than that of the serum hepatitis cases or the control cases. Also in the coproporphyrin tests 13 subjects had high alcohol intake ratings and so were not included in the norm group for this test.

Frequency or distribution curves were plotted for each test and the limits of normal determined. The 10, 5, and 1 per cent points of each distribution were listed and the transition zone of doubtful abnormality defined as extending from a point between 10 and 5 per cent to 1 per cent. Beyond the 1 per cent point was considered definitely abnormal. It was also proposed to consider a score in the transition zone abnormal if there were other evidences of abnormality and normal if there were not.

The levels for the various tests are as follows:

The serum bilirubin tests, one minute and total. The mean of the 1 minute distribution is 0.11 plus or minus 0.05 mgm. per cent. The 10 per cent point is 0.16, the 5 per cent point 0.19, and the 1 per cent point 0.24 mgm. per cent. The mean total bilirubin is 0.62 plus or minus 0.25 mgm. per cent. The 10 per cent point is 0.92, the 5 per cent 1.06, and the 1 per cent point 1.49 mgm. per cent. The transition zone from normal to abnormal for these tests may be taken with sufficient accuracy as 0.20 to 0.25 mgm. per cent, and 1.0 to 1.5 mgm. per cent, respectively.

In the thymol turbidity test the mean thymol turbidity is 3.1 plus or minus 1.5 units. The 10 per cent point is 5.0 units, the 5 per cent point 5.8 units, and the 1 per cent is 8.2 units. Values falling in the zone from 5.0 to 8.0 units may be considered questionably abnormal and values greater than 8.0 units definitely abnormal.

The mean zinc sulfate turbidity is 8.2 plus or minus 2.4 units. The 10 per cent point is 11.5, the 5 per cent point 12.5, and the 1 per cent point 15.2 units. The transition zone from normal to abnormal may be taken in round numbers from 12.0 to 15.0 units.

For the percentage of cholesterol esters the mean of distribution is 75.1 plus or minus 2.0. The upper and lower limits of normal were calculated for this test. The upper 10 per cent point of distribution is 77.8 per cent, the 5 per cent point is 78.5 per cent, the 1 per cent point 79.9 per cent. The lower 10 per cent is 72.6, the 5 per cent point 71.7, and the 1 per cent point 70.0 per cent. The zone of doubtful abnormality may thus be taken, for practical purposes, as from 72 to 70 per cent. Any value less than 70 per cent is definitely abnormal. Correspondingly, 78 to 80 per cent defines the upper zone of doubtful abnormality.

It is necessary to take into account the body weight in any discussion of normal limits for the bromsulfalein test. By calculation the author has arrived at the following corrections of bromsulfalein scores based upon weight:

Interval 110–149 pounds: Add 1 per cent
Interval 150–169 pounds: No change
Interval 170–189 pounds: Subtract 1 per cent
Interval 190–279 pounds: Subtract 3 per cent

Although the adjustment results in significant changes in bromsulfalein scores of specific weight groups, and is of value in the individual case for this reason, it produces little change in the over-all frequency distribution or the limits of normal for the group as a whole. Therefore, with no adjustment for weight the mean bromsulfalein retention is 4.7 plus or minus 2.7 per cent. The 10 per cent point is 8.2, the 5 per cent point 10.1, and the 1 per cent point 14.2 per cent. After adjusting the weight the mean retention is 4.2 plus or minus 2.4 per cent, the 10 per cent, 5 per cent, and 1 per cent points are 7.2, 9.2, and 12.6 per cent, respectively. The transition zones of doubtful abnormality for the group as a whole may be taken as 8 to 14 per cent retention if no weight adjustment is made, and 7 to 13 per cent retention if weight adjustment is utilized.

The interpretation of the hippuric acid excretion test is dependent upon adequate renal function and satisfactory urine flow. Specimens were collected for a simultaneous measurement of the urea clearance which was determined in all subjects excreting less than 0.90 gm. hippuric acid in one hour. The mean urine volume for the period of the test was 243 plus or minus 97 ml. and 97 per cent had volumes of 120 ml. or more. An average of 1.17 plus or minus 0.21 gm. of hippuric acid was excreted in one hour following the intravenous injection of 1.77 mgm. of sodium benzoate. The upper and lower limits of normal were calculated. The lower 10 per cent point is 0.90 gm., the 5 per cent point 0.82 gm., and the 1 per cent point 0.62 gm. The upper 10 per cent point is 1.42 gm., and the 5 per cent point 1.48 gm., and the 1 per cent point 1.60 mgm. The transition zone of doubtful abnormality may thus be taken as 0.90 to 0.60 mgm. A zone of questionable hyperexcretion may also be set at 1.40 to 1.60 gm.

In the galactose tolerance test the mean retention of galactose in 60 minutes is 15.9 plus or minus 8.8 mgm. per cent. The 10 per cent point is 26.0, the 5 per cent 32.0, and the 1 per cent point 42.1 mgm. per cent. The transition zone from normal to abnormal may thus be taken approximately as 30 to 42 mgm. per cent. The 45 minute time interval values gave a mean retention of galactose in 45 minutes of 39.6 plus or minus 19.6 mgm. per cent and the 5 per cent and 1 per cent points of 77.9 and 98.2 mgm. per cent, respectively.

In the urine urobilinogen excretion test the mean urobilinogen excretion is 1.4 plus or minus 1.1 mgm. per day. The 10 per cent point is 2.5, the 5 per cent point 3.3, and the 1 per cent point 5.5 mgm. per day. The range of doubtful abnormality is thus 3.0 to 5.5 mgm. per day, and any value over 5.5 is definitely abnormal.

In the urine coproporphyrin excretion the highest average coproporphyrin excretion is 232 mgm. per day obtained in the small group with the highest alcohol consumption. The lowest average value is 166 mg. per day obtained in the group that never drank alcoholic beverages. The mean coproporphyrin excretion when alcohol consumption is thus disregarded is 189 plus or minus 59 mgm. per day. The upper 10 per cent point for the group as a whole is 266 mgm. per day, the 5 per cent point is 296 mgm. per day, and the 1 per cent point is 360 mgm. per day. We may take values of 110 to 80 mgm. per day as a zone of doubtful abnormality in the

downward direction, and values of 275 to 360 mgm. per day as the zone of doubtful abnormality in the upward direction.

Two qualitative liver function tests were checked, namely, the cephalin cholesterol flocculation and colloidal red tests. In the case of the cephalin cholesterol flocculation test, 99.3 per cent of the subjects had 24 hour values of 0 and 99.6 per cent had 48 hour values of 0 or 1. For the colloidal red test, 95.1 per cent of the cases had 24 hour values of 0, and 99.3 per cent had values of 0 or 1. In 48 hours 95.8 per cent had values of 0 or 1, and 99.0 per cent had values of 0, 1, and 2.

A combination of tests, called the cirrhosis abnormality score (CAS), was calculated for each subject. The mean value was minus 10.6 plus or minus 4.0 units, and the transition zone of doubtful abnormality was minus 5.0 to plus 1.0 units.

Nine liver function tests were evaluated in a group of definite cirrhosis cases and compared with results in a group of normal subjects. The tests selected to form a representative battery were the thymol turbidity, bromsulfalein retention, serum bilirubin one minute and total, zinc sulfate turbidity, the per cent cholesterol esters, intravenous hippuric acid, intravenous galactose tolerance, and the urine coproporphyrin. These tests were compared with respect to their effectiveness in differentiating between a group of patients with cirrhosis and a normal group of patients. The best possible linear combination of the tests contributing to the discrimination between the groups was derived, and the relative importance of each test in this derived score evaluated. This analysis made it possible to decide whether or not all the tests were necessary, what the minimal number of tests was, and which were the most useful.

In order to determine the relative effectiveness with which each test, considered separately, distinguished between normal and abnormal groups, the differences between the means of the groups were compared. Furthermore, in addition to the average or group comparisons the degree of overlapping of the two groups was studied, since the separation at the extremes of the distribution largely determines the value of the test in distinguishing an individual case as normal or abnormal.

The discriminant function method of analyzing the tests was used to determine the relative weights of the tests and those with insignificant weights were eliminated and new weights calculated for the remaining tests. By utilizing the derived weights, a single score was calculated from a combination of all the tests and also from a combination of only those tests having significant weights. The relative discriminative power of these two groups (CAS) was then determined and this score contrasted with that for each test individually.

The bromsulfalein test was the most effective single test. The intravenous galactose tolerance and hippuric acid tests were approximately three-fourths as effective as the bromsulfalein test; the zinc sulfate turbidity, 24-hour urine coproporphyrin, and per cent cholesterol ester tests were approximately three-fifths as effective; and the 24-hour urine urobilinogen, thymol turbidity, and total serum bilirubin tests were approximately two-fifths as effective.

Allowing for interdependence among the tests, only four tests, the bromsulfalein, zinc turbidity, hippuric acid, and urine coproporphyrin, were found to contribute independently to the discrimination between the normal and cirrhotic groups. The other five tests made little contribution.

The cirrhosis abnormality score, obtained by a combination of these four tests, was significantly, although not greatly, more effective than the bromsulfalein test alone for group discrimination between normal and cirrhotic patients. It also misclassified fewer abnormal individuals. —*Frederick C. Hoebel, M.D.*

Episodic Coma Due to Meat Intoxication as a Fatal Complication of Portacaval Shunt in the Human Being. HENRY LEFFMAN and J. THOMAS PAYNE. *Am. Surgeon*, 1955, 21: 488.

MEAT INTOXICATION is a syndrome which was originally described in a dog having a portacaval shunt and fed on large quantities of meat. It is characterized by muscular rigidity, ataxia, loss of function of the special senses (particularly of vision), stupor, coma, and death. The neurologic state can be produced in most animals, but forced feedings with meat may be required. Withdrawal of meat, if done early enough after the signs appear, causes the animal to revert to normal. This phenomenon has been reproduced and a similar condition was recently produced in man; the patient developed episodic stupor after a portacaval shunt operation.

This report concerns a patient with a portacaval shunt who exhibited, over a period of 18 months, episodes of varying degrees of clouding of consciousness and confusion. The illness was characterized by intermittent episodes of delirium with varying degrees of disturbance of consciousness. These attacks began after the portacaval shunt had been done to relieve the portal hypertension on the basis of moderately severe cirrhosis. The attacks were at first one to two months apart, of short duration, and associated with only minor degrees of clouding of consciousness. As time went by the attacks became more frequent, lasted longer, and were characterized by deep stupor or coma. The disturbance of consciousness was strikingly similar to that described in the Eck fistula of dogs after meat intoxication. The episodes were characterized by a gritty feeling in the eyes, blindness, ataxia, confusion, stupor, and, finally, coma. They occurred with increasing frequency and ultimately caused the death of the patient.

The specific etiology of the episodic coma was not determined; however, it appeared to be related to the protein intake and terminally to a gastrointestinal hemorrhage. The episodes were quite different from classical hepatic coma.

It is postulated that the episodic coma was due to some product of the intermediary protein metabolism which the failing liver could neither receive (because of the portacaval shunt) nor adequately detoxify (because of the disease). A patient with a cirrhotic liver and a portacaval shunt is therefore in danger, not only from the well known drugs ordinarily detoxified by the liver, but also from his diet and the products of intermediary protein metabolism.

—*Stephen A. Zieman, M.D.*

Results of the Surgical Treatment of Gallstone Disease; Follow-Up Investigation. EVERT SCHILDT. *Acta Soc. med. Upsaliensis*, 1955, 60: 17.

THE AUTHOR reports the postoperative results in 500 patients operated upon for gallstone disease during the period between September, 1950 and March, 1952. The follow-up period varied from one year to three and one-half years. There were 488 survivors and 478 answered the questionnaire. Of the total number of 500 patients, 47 had had cholecystectomy only, 6 choledochotomy only, and the remainder cholecystectomy and examination of the deep biliary tract. In 16.2 per cent of the cases there were calculi in the deep biliary tract. Only those patients with symptoms were operated upon; silent stones were treated nonsurgically.

Spinal anesthesia with "light percaine" was used throughout. A modified oblique incision was preferred. The author states that the deep biliary tract should always be examined since calculi may be present in the absence of symptoms. Jaundice was absent in more than half the cases of common duct stones. Operative cholangiography is the surest and least traumatic method of examination of the biliary tract.

There were 12 deaths in the series (2.4%). The cause of death was peritonitis in 4 cases, cardiac failure in 4 cases, hepatorenal syndrome in 2 cases, massive pulmonary embolus in 1 case and postoperative hemorrhage in 1 case.

Postoperative symptoms may be "dyspeptic" or colicky in type, or a combination of both. Dyspeptic symptoms include intolerance to fatty foods, acid regurgitation, nausea, vomiting, pressure in the epigastrium, gaseous distention, constipation, and/or diarrhea. Colic is due to retained or new calculi in the deep biliary tract in not more than 1 to 2 per cent of cases, the usual cause being dyskinesia which occurs in the absence of gallbladder function, and contraction of the sphincter of Oddi. In the present series, 71 per cent are now symptom-free and 9 per cent have dyspepsia only. Fourteen per cent have attacks of colic and 6 per cent have colic and dyspepsia. A total of 80 per cent of the patients were considered healthy, 11 per cent were improved, and 9 per cent were unimproved. The prognosis in cases of calculi of the common duct is no worse. Postoperative symptoms were greater among patients with gallbladders that functioned before operation than in those in whom the gallbladder showed no function before operation.

In the diagnosis of dyskinesia, common duct calculi must be ruled out. These are usually manifested by attacks of jaundice and fever. Biligrafin examination may indicate the diagnosis. Conservative treatment of dyskinesia includes avoidance of coffee, alcohol, iced drinks, antacids and morphine, and the administration of nitrites, papaverine and duodenal irrigation with magnesium sulfate. Operative procedures include Reich's common bile duct denervation, bilateral supradiaphragmatic sympathectomy, and anastomotic operations.

Because of poor results in a not insignificant percentage of cases, there has been a trend towards conservative operations (cholecystendysis or cholecystotomy). Up to 70 per cent of all patients treated by these procedures have no recurrence of calculi. Before these conservative procedures are undertaken, the gallbladder must not be too severely damaged, the deep tract must be left free from calculi, and cholecystendysis (cholecystolithotomy) should be the procedure of choice. —*Robert Paradny, M.D.*

Cancer of the Gallbladder: a Report of 12 Cases. ROBERT E. MCCURDY and KENNETH C. SAWYER. *Am. Surgeon*, 1955, 21: 447.

THE INSIDIOUS ONSET of symptoms of cancer of the gallbladder and the early spread of this tumor to the liver and the periportal structures have mitigated against satisfactory results for the surgical cure of this tumor. These poor results obtain in spite of the facility of roentgenographic visualization and removal of the gallbladder and the increasing prevalence of roentgenologic examination of the gallbladder. The authors treated 12 patients who had primary carcinoma of the gallbladder.

The incidence of carcinoma of the gallbladder in autopsy series is less than 0.5 per cent, and between 2 and 5 per cent of all deaths from cancer are attributable to this tumor. The peak age incidence is between 40 and 80 years of age. A sex ratio of men to women of 3 to 1 has been found. The authors noted an incidence of cancer of the gallbladder of 2.8 per cent in 425 biliary tract operations. No specific etiologic agent has been proved to initiate cancer of the gallbladder; yet, gallstones and inflammation are almost invariably found. Papillomas of the gallbladder may be considered as definite precancerous growths.

The symptomatology related to cancer of the gallbladder is no different from that of cholecystitis and cholelithiasis. More than 70 per cent of the patients found to have cancer of the gallbladder had a history of long-standing biliary tract disease. Right upper quadrant pain and dyspepsia are the most frequent symptoms. The rapid loss of weight in a patient who has had gallbladder disease for several years definitely suggests a malignant condition. Only one-half of the patients may be expected to have jaundice or a palpable mass. The authors were unable to find a report of a patient who had a palpable mass who survived for more than 2 years.

Early surgical removal of the cancer of the gallbladder is the only known satisfactory treatment. In general, people who have survived 5 years after the diagnosis of cancer of the gallbladder are those whose neoplasms were found incidently after cholecystectomy. Procedures such as cholecystectomy and partial hepatectomy or cholecystostomy have in reality afforded only poor palliation.

The two major types of adenocarcinoma of the gallbladder are: infiltrating adenocarcinoma and papillary adenocarcinoma. In approximately 10 per cent of instances a colloid type of adenocarcinoma may be present.

The authors strongly recommend cholecystectomy in patients who have been shown to have gallstones if there is no medical contraindication to surgery. The primary rationale for recommending cholecystectomy is not that of removing the gallbladder which may develop carcinoma, but the knowledge that the complications of gallstones and benign cholecystic disease

far outweigh the mortality rate of cholecystostomy. The demonstration by roentgenographic techniques of a papilloma of the gallbladder is an indication for cholecystectomy. —*Jerry A. Stirman, M.D.*

A Study of Cholecystectomy. BENJAMIN F. BYRD, JR., and JOHN H. GRISCOM. *Ann. Int. M.*, 1955, 42: 1181.

THIS STUDY was based on 1,006 cholecystectomies accomplished during the 20 years from 1934 to 1953, inclusive. Of these, 136 were accompanied by a common duct exploration. The total number of cases were divided into four 5-year periods and revealed in each group a steady increase in the number of procedures carried out. The difference in these periods lies principally in the change in hospital stay of the patient and in the postoperative morbidity and mortality. There was a steady decline in the duration of hospitalization of the patient with a simple cholecystectomy, but the rather remarkable fact that there was no change in the stay after cholecystectomy with associated exploration of the common duct was probably a reflection of the cautious nature of the surgeon.

Simple cholecystectomy in this series was associated with a mortality of 1.8 per cent. In the instances in which surgical exploration of the common duct was indicated the mortality and the incidence of complications both decreased in the last 5 year period. The over-all mortality in this group was 6.7 per cent. There were 98 patients who, after simple cholecystectomy, had some serious disturbance in the postoperative course, an incidence of 11.3 per cent. Of these, 49 had disturbances which were systemic in character and were largely pulmonary in type, while 33 were local and related to the immediate operative field. The causes of death in the remaining 16 cases were listed. The character of the complications following cholecystectomy with associated exploration of the common duct was much the same as that described for simple cholecystectomy except that the incidence of complications was 22.8 per cent. In most instances the deaths after exploration were a reflection of the poor condition of the patient at the time of surgery.

In the 20 year period only one patient was readmitted for common duct obstruction after a cholecystectomy without exploration. This patient had a partial cholecystectomy for acute cholecystitis and returned 2.5 years later, at which time the remainder of the gallbladder was removed and a stone was removed from the common duct.

During this period of 20 years there were 3 individuals in whom the common duct was inadvertently divided during the removal of the gallbladder. In all 3 instances the error was recognized and a primary repair carried out at the time. All of these have had no evident ill effects from their experience. There was no known instance of postoperative stricture of the common duct. —*Edmund A. Gorvett, M.D.*

The Importance of Variants and Anomalies of the Biliary Passages for the Surgeon (Die Bedeutung von Varianten und Anomalien der Gallenwege fuer den Chirurgen). HERMANN SCHMIDT. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 434.

THE NORMAL ANATOMY of the biliary duct system is described with emphasis on the fact that, even though a normal pattern exists, every single case will be slightly different. Two primary branches join to form the hepatic duct—the principal rami, right and left. These, in turn, are formed by secondary ducts—the ramus dorsalis and ramus ventralis on the right, and the ramus dorsolateralis, ramus ventrolateralis, and ramus medialis on the left. Absence of the right ramus principalis may be considered a normal variant, the rami dorsalis and ventralis then leading directly into the hepatic duct. On the left all secondary and smaller ducts, and on the right all tertiary and smaller ducts, are intrahepatic.

The author has taken a number of cholangiograms of living and of postmortem specimens, some of which are shown in the original article. The more important anomalies are described:

A. Hepatic duct system: (1) the secondary branch goes directly into the hepatic duct (mainly on the right side), (2) the tertiary branch goes directly into the hepatic duct, and (3) the primary branches fail to join properly, which results in a "double" hepatic or common duct. In the latter case, the gallbladder may be connected only to the right duct system.

B. Cystic duct and gallbladder bed: (1) the cystic duct leads into the ramus principalis dexter, or into one of its secondary or tertiary branches, (2) one or several rami hepatocystici, coming from somewhere in the liver, go into the gallbladder, (3) the cystic duct is absent and the gallbladder is situated between the hepatic duct and ductus choledochus, and (4) the rami superficiales subvesicales may exist in the gallbladder bed. They are supposed to have (during embryonic life) drained bile from the liver parenchyma and later degenerated. They connect with one of the right hepatic branches or with the hepatic duct itself.

That every surgeon operating in this region should be aware of these anomalies is quite obvious. Several points are particularly stressed by the author—exploration of the biliary duct system for calculi may become very difficult and it may be impossible to probe certain abnormally located branches. Operative injury to the abnormal structures is common. If the aberrant drainage of the cystic duct into one of the branches of the hepatic duct is unrecognized, this branch may be ligated and serious complications will then arise. The superficial subvesical branches are often invisible, and are easily injured when the gallbladder is dissected out of its bed. The rami hepatocystici are also easily overlooked.

The different methods of cholangiography are briefly summarized. Intravenous application is often unsatisfactory as the smaller ducts are not visualized. Details may at times be brought out by tomograms. This is also true of oral contrast media. Peritoneoscopic and percutaneous applications of dye are difficult and not without danger. The value of operative cholangiography, of which there are several technical varieties, is appreciated. —*Fritz H. Moser, M.D.*

A New Approach to the Junction of the Hepatic Ducts (Recherches sur la chirurgie du confluent biliaire supérieur et des canaux hépatiques). C. COUINAUD. *Presse méd.*, 1955, 63: 669.

THE CUSTOMARY APPROACH to the junction of the hepatic ducts is by following the common hepatic duct

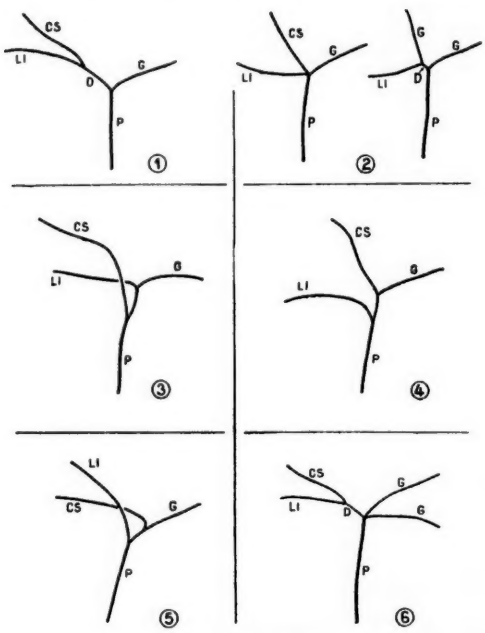


FIG. 1 (Couinaud).

superiorly, with aspiration in the direction of the bile ducts as a guide. This is difficult dissection, especially if scar tissue is present, and the resulting exposure frequently leaves much to be desired.

The author recommends a superior approach through the liver.

The liver is exposed through a right thoracoabdominal incision, through the bed of the eighth or ninth rib. The falciform ligament, including its posterior continuation, is divided. The gallbladder, if present, is peeled out of its bed. A narrow fibrous band is seen stretching from the anterior border of the hilum to the bed of the gallbladder; this band is divided between ligatures. The peritoneum along the posterior border of the quadrate lobe is divided. The portal triad is but loosely attached to the liver, and a space can be bloodlessly dissected between the fanning out of the right and left branches of the component structures of the triad and the liver.

The substance of the liver is to be divided along the theoretical "fissure" which is crossed only by one major structure—a branch of the sagittal vein. The vertical plane inclines down and to the right at an angle of about 75 degrees, ending in the gallbladder fossa along the left border of the vena cava.

Two strips of fascia lata are laid along the proposed line of incision, extending from the superior surface of the liver to the inferior surface, and two rows of hemostatic sutures are laid through the strips and the entire thickness of the liver with a specially long needle. The liver is now divided between the two rows of suture and opens "like a book." The confluence of the right and the left hepatic ducts is in direct relation to the superior aspect of the expansion of the portal triad. Only in 13.5 per cent of the cases are the ducts crossed by a major artery.

The variations of the confluence of the hepatic ducts on the basis of 100 dissections are shown in Figure 1.

The anastomosis is easily carried out; end-to-end reconstruction of the duct is preferred whenever feasible. If the junction of the hepatic ducts is involved and has to be sacrificed, the author recommends an anastomosis of the common hepatic or common bile duct with the major intrahepatic duct, and a Roux-Y cholangiojejunostomy with the other duct; if the common duct is not available, the hepatic ducts are anastomosed separately to a single limb of jejunum. T-tubes are used to splint the anastomoses in the usual manner. —*Leonid S. Cherney, M.D.*

Two Cases of Repair of the Main Bile Tract (Deux cas de restauration de la voie biliaire principale). CLAUDE D'ALLAINES. *Sem. hôp. Paris, Ann. chir.*, 1955, 31: 356.

THE AUTHOR discusses briefly different techniques for restoration of the main bile tract and reports 2 cases of his own experience.

More than a hundred different procedures have been published; however, at the present time only three methods have retained their value. These are hepaticojejunostomy in the shape of a Y, direct suture, and the operation of Longmire. In most cases hepaticojejunostomy is the method of choice; however, in certain rare cases one of the other two methods may be preferable. All other techniques, like grafts from the ureter, intestine, or skin, or the use of vitallium tubes, have been abandoned by most surgeons.

In the first of the author's 2 cases the patient had been operated on twice before (cholecystectomy and choledochogastric anastomosis because of a biliary fistula); the indication for the third operation was given by severe icterus, fever, and a poor general condition. The entire inferior portion of the hepatic duct was found stenosed at the intervention whereas the inferior choledochus was normal. The stenosed portion was resected, the second part of the duodenum was liberated, and a direct hepaticocholedochus anastomosis was performed. A tube was inserted in the choledochus, passed into the duodenum, and left in place for 3 months. The early and late results were very satisfactory; 29 months after the intervention the patient remained free of complaints.

In the second case the patient had been operated on three times before: cholecystectomy, followed by complete and permanent biliary fistula; an attempt at repair, unsuccessful because of an inflammatory sheath around the pedicle which contained a dense network of collateral vessels and made any approach to the fistula impossible; and splenectomy for portal hypertension. Because of the marked portal hypertension the surgeon suspected that the collateral vessels around the hilus would make dissection impossible, and the operation of Longmire was performed. Incision left of the round ligament and anastomosis of the third portion of the hepatic duct to a loop of jejunum was performed. The fistula was left intact. The patient made an uneventful recovery and was in good health 12 months after the operation.

In summarizing, the author states that although the indications for these two techniques are quite rare these techniques have their merits in certain well defined conditions. —*Werner M. Solmitz, M.D.*

Transcholedochal Intubation; Protective Therapy of the Liver After Operations on the Biliary Passages (Die transcholedochale Sonde, zur Leberschutztherapie nach Eingriffen an den Gallenwegen). G. MOLLOWITZ. *Chirurg*, 1955, 26: 244.

THE DANGER of hepatic insufficiency following surgical procedures on the biliary system can be greatly reduced by proper protective therapy of the liver.

In view of the fact that liver cells rich in glycogen have a greater resistance than those with lower glycogen contents, the administration of sugar is essential. Whereas only 17 per cent of the ingested glucose is stored in the liver in the form of glycogen, the corresponding figure for orally administered levulose is 39 per cent. The glycogen deposits are still higher when invert sugar, which is a mixture of glucose and fructose, is used instead of dextrose or levulose alone. Glycogenesis is further stimulated by the administration of choline and vitamin B complex.

The introduction of a mixture containing invertose, choline, and vitamin B complex through a nasal catheter meets with the criticism that not infrequently the gastric tube is not well tolerated by the patient and the mixture may be regurgitated by the stomach. To overcome these drawbacks the author conceived the idea of introducing the mixture into the duodenum through a transcholedochal tube. After exploration of the common duct a capillary plastic tubing is introduced into it through a specially designed metal instrument and is carried through the papilla into the duodenum (Fig. 1). The customary T-tube is then placed next to it through the same opening in the common duct. It is not advisable to place the capillary plastic tube within the rubber T-tube as it may facilitate the clogging of the latter. A portion of the capillary tube, from 8 to 10 cm long, should lie within the duodenum.

Immediately following the operation the capillary tubing is connected with an infusion apparatus, and the drip is started. The sphincter of Oddi prevents a reflux of the mixture or the duodenal contents into the biliary system.

The amount infused the first day should not exceed 200 c.c., while on the following days from 1 to 2 liters can be given. Untoward effects have not been observed.

Starting with the sixth postoperative day, the patient's own filtered bile is added to the mixture. The capillary tube may be left *in situ* as long as 8 weeks and can be removed concurrently with the T-tube, before or after it. —*Joseph K. Narat, M.D.*

The Pulmonary Manifestations of Fibrocystic Disease of the Pancreas. PAUL A. DI SANT'AGNESE. *Dis. Chest*, 1955, 27: 654.

THIS DISEASE was first briefly recorded in 1936 by Fanconi in Switzerland, but its first complete description was given in 1938 by Andersen in this country. The principal disorder is the absence of pancreatic enzymes with the association of respiratory trouble

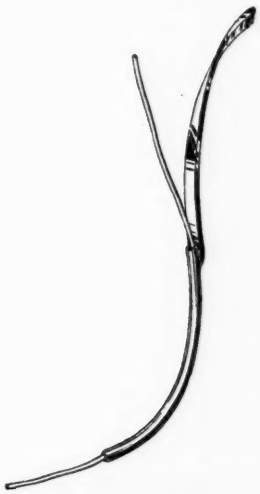


FIG. 1. (Mollowitz).

that may appear any time from the age of a few weeks to that of several years. The disease is rare in negroes and has never been found in mongolians.

It has recently been shown that another organ system, the sweat glands, is consistently affected in this disease and cirrhosis of the liver is found in a lesser degree. The extent of bronchial and pulmonary involvement is usually the dominating feature which determines the fate of the patient.

The basic nature of this widespread disturbance is as yet not known. It has been postulated that mucus secreted in various parts of the body may be abnormal, thus causing obstruction of the pancreatic ducts with consequent limitation of secretory acini and fibrosis of the gland. By the same token, failure to remove bronchial mucus secretion leads to obstruction of the air passages and secondary bronchopneumonia. This hypothesis thus gives a reasonable explanation of the pulmonary and pancreatic lesions, but does not account satisfactorily for the electrolyte abnormality of sweat.

The diagnosis depends upon, first of all, the pancreatic insufficiency which leads to steatorrhea, large, bulky, foul stools, and the absence of pancreatic enzyme activity on duodenal assay. The pulmonary pathology is characterized by obstructive emphysema and chronic bronchopneumonia. Abnormal sweating is usually apparent with abnormally increased sweat chloride and sodium which leads to acute salt depletion and at times death in hot weather. The family history of similar conditions in siblings is often helpful.

Ten per cent of the patients with fibrocystic disease of the pancreas present congenital intestinal obstruction, the so-called meconium ileus, at birth. About half of these babies succumb immediately and the other half are operated upon successfully.

The degree of bronchial and pulmonary involvement determines the fate of the patient. If untreated, the great majority of the patients succumb to a

progressive chronic bronchopneumonia. The condition of these children seems to improve if they can be carried over to the age of approximately 10 years, although many of them must remain on antibiotics indefinitely. While the prognosis of a patient with fibrocystic disease of the pancreas is serious and at best guarded, it is not hopeless.

Of the 292 children with this condition seen to date at the Babies Hospital in New York, 133 have died and 159 are living. Of the latter, 29 are from 10 to 18 years of age and some of them are, as a matter of fact, doing quite well. —*Matthew H. Evoy, M.D.*

Pancreatic Lithiasis and Chronic Pancreatitis: Treatment by Pancreatic Lithotomy a Tergo and Retrograde Pancreaticojejunostomy. IAN AIRD and JOSEPH BUCKWALTER. *Brit. J. Surg.*, 1955, 42: 491.

THE SURGICAL TREATMENT of chronic pancreatitis by any of the available operative techniques has not been completely satisfactory. Total pancreatectomy is not a welcome alternative. The authors describe a different approach for the removal of stones from the pancreas and the subsequent drainage of the pancreatic duct system.

A 42 year old woman had intermittent bouts of severe upper abdominal pain beginning in early childhood. Repeated diagnostic procedures had failed to demonstrate the cause of this pain. At 34 years of age an appendectomy was performed; exploration revealed the presence of chronic pancreatitis and multiple calculi within the head and body of the pancreas. Following operation she was free of pain for 3 years, but the previous symptoms recurred. A bilateral splanchnicectomy was performed which afforded only temporary relief. During the next 4 years the patient continued to have attacks of pain three or four times a year and lasting for 7 or 8 day intervals.

At the time of the last hospital admission physical examination demonstrated only a chronically ill woman. An x-ray examination of the abdomen showed multiple, irregular areas of calcification in the region of the pancreas. There was a mild diabetes, although there had been no glycosuria. Pancreatic enzyme activity in the stools was normal. The remainder of the laboratory examinations were negative. An exploratory laparotomy was performed. The pancreas was enlarged with multiple, hard, irregular masses palpable within the head, body, and tail. The changes appeared to be maximal in the left half of the pancreas. After mobilization of the spleen and the body of the pancreas, the pancreas was excised to the left of the superior mesenteric vein. Through the dilated pancreatic duct a gallbladder scoop was used to remove the calculi. Then a probe readily passed into the duodenum. A Roux-y anastomosis was performed, the cut end of the pancreas being implanted into the defunctionalized jejunal loop.

Since the operation the patient has required insulin to control the diabetic state and has had persistent diarrhea. Even though the diarrhea has slowly diminished in intensity, the patient obviously has some degree of pancreatic insufficiency. She has been completely free of pain. There has been a remarkable reversal from a depressed individual to an active, enthusiastic person.

The authors suggest that this type of procedure may well be the preferable one for chronic pancreatitis with obstruction of the duct by stones.

—*Jerry A. Stirman, M.D.*

Rupture of the Spleen. J. L. CONNELL. *Med. J. Australia*, 1955, 1: 677.

THE AUTHOR presents a detailed study of rupture of the spleen, with case reports, diagnostic sketches, roentgenograms, and pathologic specimens. Although lying in a protected position, the spleen is the most frequently injured intra-abdominal organ. The reason for this is its mobility, friability, and its close proximity to the ribs. Profuse hemorrhage usually follows the rupture of splenic tissue because of the nature of the parenchyma of the organ and its excellent blood supply.

The most frequent types of force involved are (1) blast injury, (2) direct trauma to left chest, (3) penetrating wounds, and (4) indirect forces. The degree and rapidity of bleeding depends on the number of tears and the proximity of the latter to the hilum. Hilar tears progress rapidly to profound shock.

The clinical picture may vary in the presence of (1) primary rupture, (2) delayed clinical symptoms, and (3) rupture with spontaneous healing. Primary rupture is recognizable by the manifestation of acute abdominal disease and blood loss. In about 20 per cent of all cases the patient is asymptomatic for days or weeks. There is evidence that minor ruptures may heal spontaneously. A case is presented in which an abscess had formed in a blood clot associated with previous rupture of the spleen.

A variety of symptoms and signs may be present. There is usually a history of injury, and fractured ribs may be present. Shock is manifest early if there is significant blood loss, and associated injuries. Upper abdominal pain is invariably present. Referred pain to the shoulder (Kehr's sign) is present in 25 per cent of cases. In its absence, this sign may be elicited by placing the patient in the Trendelenberg position. Shoulder pain may be relieved by sitting up. The patients are pallid, with increasing pulse rate; however, the blood pressure may remain normal for a long time. The abdomen is always tender, and tenderness may be limited to the left upper quadrant or be generalized. Abdominal distention may occur because of the presence of fluid and paralytic ileus. In 80 per cent of cases dullness is increased in the splenic area, and in 25 per cent Ballance's sign can be elicited. Since damage to the left kidney is a frequent accompaniment of ruptured spleen, hematuria is of great significance.

X-ray examination of the abdomen may reveal: (1) increased density in left upper quadrant, (2) elevation of the left diaphragm, (3) displacement of the stomach to the right, and (4) the presence of free fluid between intestinal loops. The splenic hematoma may imprint itself on the stomach air bubble. For obvious reasons, paracentesis is of questionable value.

In many cases of rupture of the spleen (40 to 50 per cent) there are associated injuries; however, the injury to the spleen is the most serious of these. The most frequently observed associated injuries are: (1) fractured ribs, (2) fractured extremities, (3) lacerated

kidney, and (4) lacerated liver. The differential diagnosis should consider (1) fractured rib, (2) ruptured intestine, (3) ruptured liver, (4) lacerated kidney, (5) perforated ulcer, and (6) ruptured ectopic pregnancy.

In delayed rupture of the spleen there is usually a history of shock following the initial injury, with subsequent recovery. Delayed rupture most often occurs within the first week, and rarely after 2 weeks. The sequence of events in delayed rupture may be as follows: (1) perisplenic hematoma which is confined, and (2) intrasplenic rupture. A higher mortality is associated with delayed rupture, because, when the hematoma ruptures, there is rapid exsanguination. Secondary rupture may be induced by minor exertion. The authors present several cases which tend to support the thesis that a normal spleen can rupture spontaneously.

The treatment of ruptured spleen is surgical. Early splenectomy is imperative. Certainly shock should be treated simultaneously with preoperative preparation. The blood volume should be replaced rather rapidly. The author prefers a long left paramedian incision for emergency splenectomy. The technique is described. Mobilization of the spleen is accomplished by dividing the gastrosplenic ligament which allows rotation with subsequent division of the lienorenal ligament. Mass ligation of the pedicle is decried. Individual ligation is desired, but the multiple clamp and tie method may be used. The tail of the pancreas can usually be avoided.

A common complication of ruptured spleen is atelectasis of the left lower lobe. Paralytic ileus is common and is secondary to operative trauma and blood in the peritoneal cavity. Disruption of the wound is most likely in cases in which the pancreas has been injured. Thrombophlebitis may occur probably as a consequence of the increase in platelets. Dilatation of the stomach is associated with preoperative and/or postoperative status.

—*Richard L. Lawton, M.D.*

MISCELLANEOUS

Pathologicoanatomic Findings in a Case in Which a Gauze Sponge Remained *in Situ* 42 Years (Pathologisch-anatomische Befunde an einem 42 Jahre lang in situ verbliebenen Gazetupfer). V. BECKER. *Chirurg*, 1955, 26: 264.

A 77 YEAR OLD MAN underwent in 1912 a right nephrectomy on account of hydronephrosis and pyelitis produced by lithiasis. He remained in good health until 1952 when cystostomy, followed by prostatectomy, was performed. Recurrence of adenomyomatosis of the prostate required repeated resections in the course of the following 2 years. In 1954 a stone was removed from the left kidney. The patient succumbed to perinephric abscess with resulting toxemia.

The autopsy revealed in the location of the right kidney a hard, globular formation, of the size of an apple, with a smooth surface, which was adherent to the erector spinae muscles. A section through the tumor showed it to be a cyst with a thick wall, its contents resembling those of a sebaceous cyst. In the thick mass were embedded shreds of a gauze sponge. The capsule was of a fibrinohyaline character with very few foreign body giant cells. —*Joseph K. Narat, MD.*

GYNECOLOGY

UTERUS

A Histochemical Study of the Cervix Uteri. J. D. Wheeler and Sara Danziger. *Obst. Gyn.*, 1955, 5: 739.

Histochemical methods for the demonstration of alkaline phosphatase, acid phosphatase, nonspecific esterase, lipids, epithelial mucin, glycogen, and protein-bound sulfhydryl and disulfide groups were applied to uterine cervices in all phases of the menstrual cycle and in the postmenopausal era. This was done to establish a basis for the investigation of physiologic (pregnancy) and pathologic changes in the cervix uteri by these methods. The results are described and illustrated. The material was examined carefully for evidence of cyclic cervical changes. It was impossible, however, to recognize the phase of the menstrual cycle in the cervix from the various reactions to these substances.

—*Alan Rubin, M.D.*

Endometrial "Granule" Cells (Die endometrialen Körnchenzellen). Gisela Hellweg. *Geburtsh. & Frauenh.*, 1955, 15: 521.

The granule cells of the endometrial stroma have been recognized for more than 30 years. These cells are found, usually in groups, during the secretory phase, near the pseudodecidual cells. Following menstruation and after the third month of pregnancy, they are no longer seen. They are not found in glandulocystic hyperplasia or in corpus carcinoma. They were found in one case of adenoacanthoma by the author.

The cells themselves resemble lymphocytes, but they are much more difficult to stain. This probably accounts for their infrequent mention in the literature. The nuclei assume many shapes. One to twenty acidophile granules are found in the cytoplasm. The origin of the cells is unknown; they probably arise from undifferentiated stromal cells and multiply by amitosis.

—*Warren R. Lang, M.D.*

Vascular Tumors of the Uterus; Benign Vascular Tumors; Malignant Vascular Tumors. Paul Pedowitz, Laurence B. Felmus, and David M. Grayzel. *Am. J. Obst.*, 1955, 69: 1291, 1309.

Benign and malignant vascular tumors of the uterus have been classified. Ten more cases are added to 128 previously reported cases of benign blood vessel tumors of the uterus.

Histogenetically, these neoplasms arise from primitive mesoderm or from budding endothelial outgrowths of previously formed capillaries. Hemangiomas have their origin in blood vessels, and lymphangiomas arise from lymph vessels. Associated smooth muscle growth results in angiomyomas, and associated fibrous connective tissue growth in lymphangiocystic fibromas.

Benign vascular tumors may be differentiated from simple telangiectasia by the presence of both old and newly proliferated capillaries within the neoplasm.

Such symptoms as appear are secondary to the size and location of the tumor within the uterus. The neoplasm bears no relationship to parity, but age does have some influence. The incidence of vascular tumors of the uterus is highest in the late childbearing years and during the early menopausal years.

Treatment is surgical removal of the tumors.

A review of uterine tumors previously classified as sarcomas and hemangioendotheliomas has shown that 10 were vascular neoplasms: 3 hemangioendotheliomas and 7 hemangiopericytomas. Special stains are essential to delineate the basically vascular structure of angiosarcoma, as well as to distinguish various types of vascular tumors of the uterus.

Abnormal vaginal bleeding is the most common symptom associated with angiosarcoma. The preferred treatment for hemangioendothelioma and hemangiopericytoma with metastasis is total hysterectomy and bilateral salpingo-oophorectomy, followed by deep x-ray therapy.

Although hemangioendothelioma is very often malignant, hemangiopericytoma is relatively benign. A review of tumors previously designated "stromal myosis" revealed their appearance to be identical with hemangiopericytoma, a tumor found in other organs as well as the uterus. For that reason hemangiopericytoma, rather than "stromal myosis" or endothelial sarcoma, would better designate the new growth.

—*Charles Baron, M.D.*

Cancer of the Endometrium, Positive in the Preceding Biopsy but Not Confirmed at Operation (Cancer de endometrio positivo en la biopsia previa, no confirmado en la pieza operatoria). Rodolfo A. De Filippo. *Rev. As. méd. argent.*, 1955, 69: 5.

Three instances of cancer of the endometrium are reported.

The first patient was a 64 year old woman who was curetted for metrorrhagia. A large amount of material was procured, frozen sections were prepared, and a microscopic diagnosis of endometrial blastoma was made. The curetted material was then included in paraffin and the diagnosis confirmed. Sections prepared from the endometrium of the removed uterus disclosed an atrophic, cystic mucosa without evidence of neoplasm. In one place, however, there was observed granulation tissue containing neoplastic cells. This finding was interpreted as representing the pedicle of an adenocarcinomatous polyp.

The second patient was a 60 year old woman who underwent extirpation of a polyp which was protruding from the orifice of the uterine cervix. The diagnosis of this specimen was carcinosarcomatous polyp. Fifty-two days later the uterus was removed. Here again there was observed a small zone characterized by the presence of granulation in which were atypical cells. This finding was also interpreted as being the pedicle of a carcinosarcomatous polyp.

The third patient was a member of the family of one of the functionaries of the Rivadavia hospital in

Buenos Aires, Argentina. The curettement was carried out by the author personally and the greatest care was given to the curetted material. The diagnosis was adenocarcinoma in an endometrium in the secretory phase. Another pathologist confirmed the diagnosis. After operation 15 days later, the removed uterus was examined by the latter pathologist who was unable to find any evidence of malignancy in the endometrium.

In none of these instances was there any possibility of a substitution of specimens.

From this material the author arrives at the following conclusions:

1. Biopsy may remove all of the neoplastic tissue or otherwise render negative the findings of endometrial malignancy.

2. The entire endometrium should be examined to guard against overlooking the zone of implantation of the blastomatous polyp or the zone of residual malignancy.

3. This disputed phenomenon should in no wise influence the conduct of the treatment; it should simply represent an element of scientific speculation or bibliographic commentary. Here the author recalls Halban's words: "There is no cancer present, nevertheless the uterus had better be removed."

4. The same criterion which some writers use with reference to their doubt regarding the possibility of the substitution of biopsy specimens might just as well serve as an aspersion on the whole task performed by the pathology services.

5. The same ethics as those of the surgical services should apply to the pathologists; the judgments should be of the same preparations and not of separated portions of a specimen, and the judgments should not be expressed separately but should be arrived at during a consultation of the pathologists concerned.

—*John W. Brennan, M.D.*

The Relationship Between Hyperplasia of the Endometrium and Corpus Carcinoma (Beitrag zur Frage der Beziehung zwischen der Hyperplasie des Endometrium und dem Korpuskarzinom). GERHARD WASCHKE. *Geburtsh. & Frauenh.*, 1955, 15: 557.

ONE THOUSAND TWO HUNDRED AND SIXTY-TWO cases of endometrial glandular hyperplasia and 138 cases of endometrial carcinoma observed at the Berlin-Spandau Hospital from the years 1945 through 1953 were reviewed in an effort to determine the relationship between hyperplasia and cancer.

Among the 1,262 patients with endometrial hyperplasia, there were 16 showing adenomatous, atypical, suspicious changes. These were followed up for varying periods of time and curettage was performed when bleeding occurred or merely as a control measure. None of the 16 developed cancer of the endometrium.

Eight of the 138 patients with endometrial carcinoma had associated glandular cystic hyperplasia. In none could a direct connection between the two lesions be proved. The author does not believe that the two lesions were related, but that since both occurred in the fourth and fifth decades of life, they were found together coincidentally.

—*Warren R. Lang, M.D.*

Experience with Radioactive Colloidal Gold as an Additional Treatment in the Radiotherapy of Uterine Cancer. H. L. KOTTMEIER and G. MOBERGER. *Acta obst. gyn. scand.*, 1955, 34: 1.

TREATMENT OF CHOICE for carcinoma of the cervix in Sweden (Radiumhemmet Stockholm) is radiotherapy with no significant alteration of the traditional Stockholm technique except for more exact individualization of dosage. At the Radiumhemmet 363 patients were treated in 1950 and there was an absolute 3 year recovery rate of 56.8 per cent for all patients, and 91.9 per cent for those with a stage 1 carcinoma of the cervix. Eight per cent received palliative doses of radium and/or x-rays only.

The treatment of carcinoma recurring after adequate radiation, often first appearing as nocturnal backache or pain in the hip, is still a difficult problem. Excision and radiation, multimillion volt radiation, and transvaginal x-ray therapy have been tried and reported as successful. However, it is sometimes impossible to decide whether a palpated mass is due to a recurrence or to the induration of radiation. Opinions also differ as to the results of prophylactic lymphadenectomy of the pelvic nodes (Taussig *et al.*). Usually the problem is symptomatic treatment of violent pain, especially in young patients. At the Radiumhemmet all sorts of injections, copratoxin, subarachnoid administration of alcohol, and presacral neurectomy have been tried, but palliation of short duration only could be obtained.

Colloidal particles like carbon or gold are phagocytosed by macrophages and taken up by the reticuloendothelial cells in the lymphatic tissue. Radioactive gold has several advantages over other isotopes used for local irradiation; it is stable, chemically inert, has a short half-life of 2.69 days only, and emits only about 5 per cent gamma rays. Preliminary experimental studies (Allen, Sherman *et al.*) had shown that a colloidal gold pectin suspension injected into the parametrial tissues produced a definite radiation effect, and that the active particles were carried to the regional lymph nodes. It has also been established that 70 mc. of radioactivity may be much below the tolerance dose, and that 25 to 50 mc. should probably be injected locally into each parametrium.

The authors studied the effect of intraparametrial radiogold infiltration on 10 patients previously radiated for carcinoma of the cervix with suspected lymph node metastases. Between 40 and 56 mc. of radioactive gold were injected bilaterally into the paracervical tissue through the lateral fornices of the vagina. Laparotomy was then performed 2 to 12 days after the injection in 8 patients with bilateral lymphadenectomy. The nodes thus recovered were subjected to microscopic examination, autoroentgenography and Geiger counter estimation of remaining radioactivity.

The highest radioactivity was found at the site of the original injection into the parametrial tissues. A considerable uptake was noted in the pelvic nodes, but the radioactive material was specifically restricted to the lymphoid tissue and was not increased in hyperplastic nodes; it also appeared to increase from the second to the sixth day, corresponding with the histological phase of increasing cell proliferation mostly of cells with phagocytic capacity. In 2 patients the spe-

cific activity of a few lymph nodes exceeded somewhat that of the injected parametrial tissue, thus indicating an active accumulation of radioactive material in the lymphatic tissue. Metastatic areas in the nodes, and nodes, totally taken up by metastases, as in a few advanced cases, showed no isotope uptake at all.

Signs of radiation necrosis, endarteritis, fibrosis and giant cell formation were found at the site of injection and in the intact noninfiltrated lymph node parenchyma. These changes were even more pronounced in discrete islets of metastasis within the nodes and after 4 to 6 days following the injection, ranging from nuclear abnormalities to complete necrosis. In nodes completely occupied by metastatic cancer moderate radiation changes were noted especially in the periphery, emanating from the adjacent lymph nodes with intact parenchyma.

After these encouraging studies the authors used the method in 50 cases, usually when conventional x-ray therapy had failed. In 5 patients with firm pelvic recurrence infiltration directly into the mass brought no obvious relief of symptoms. Of 4 patients with diffuse infiltration of the parametrial tissue only 2 had less pain after gold instillation. However, in 36 of 41 cases with fairly soft paracervical tissue and pyramidal infiltration close to the pelvic wall the palliative effect was remarkably good. In some patients an initial generalized reaction to the procedure with more severe pain for a few days was encountered, but no evident damage could be attributed to the method in the long run.

Since so much of the radioactive substance remains in the paracervical tissue the question of a local overdosage has been raised. By the additional injection of hyaluronidase, with its increased permeability of the capillary walls, the radioactive substances were dissipated much more rapidly in rabbit experiments. While paracervical tissue and regional nodes contained less radioactive material, there was an increased uptake in the circulating blood, most of which was accumulated in the liver during the first few hours after administration. For this reason the use of hyaluronidase cannot be recommended. The authors' statistics agree with other statistics showing the value of radioactive gold in the palliative radiation therapy of pain due to carcinoma recurrence in the pelvic lymph nodes. —*W. D. Bergman, M.D.*

Modern Surgery of Cancer of the Uterine Cervix and of Cancer of the Breast (Chirurgie moderne du cancer du col utérin et du cancer du sein). J. L. BRENIER. *Bordeaux chir.*, 1955, p. 9.

FOLLOWING THE PERIOD of exclusive predominance of radical surgery, the very existence, certainly the high prestige, of surgery of cancer began to be threatened, partly because the most radical surgery at that time did not cure cancer with any degree of reliability, and partly because new methods (roentgenology, radium) began to claim the enthusiastic support of the profession. There were two eventuations which brought surgery back to its rightful place. The first was the realization of the irradiation enthusiasts that, with reference to the actual cure of cancer, these methods were proving to be disappointing in many instances; the second was the advent of the enlarged surgical operation, the period when the whole of the affected organ might be removed together with parts or the whole of neighboring organs. Of course, this was helped immeasurably by the perfection of our antishock methods and by the advent of the antibiotics.

However, these enlarged operations were largely standardized and uncontrolled, that is, the same operation was repeated over and over on any condition to which it could be made to fit. The present era is one of controlled cancer surgery. With the protest of, among others, Wangensteen against this form of uncontrolled radicalism, there was developed such expedients as the "second look" or the reintervention of control. This reintervention as recommended by Wangensteen consists of re-entering the abdomen in uterine cancer 6 months after the original removal of the tumor (hysterectomy plus). Although this American surgeon is still not able to provide reoperated patients controlled for a sufficient length of time to admit of evaluation, he does report that in 75 per cent of these re-operations after which residual cancer was found, it was still operable. On the author's service this "second look" technique is just being adopted.

The term "controlled operation" seems to derive chiefly from the fact that the determination as to the extensiveness of the operative procedure is controlled by the findings of the preoperative microscopic examination of the regional lymph nodes.

Since 1950 in France, 3 different techniques have been brought to light. The technique of Tailhefer included an excellent lymphatic toilet of the lateral regions of the pelvis, that of Dargent is more extensive attacking also the posterior lymph gland system, but it does not make any pretense of attempting a monoblock removal of the tissues of the pelvis. This method of monoblock has recently been described by Robert and is the method used at present by the author with entire satisfaction. In the author's opinion the classical Wertheim operation is insufficient; however, there is still not sufficient time since the introduction of this new technique to permit of evaluation. Nevertheless, this last technique is very like that of Meigs and Nathanson and their figures indicate a premicroscopic involvement of the lymph gland groups, which is beyond that of those with macroscopic involvement in 17 per cent of all cancers of the uterus in stage I and in 32 per cent of those in stage II.

On the author's service at Grenoble, France, the present treatment of cancer of the cervix consists for stages I and II (Geneva classification) of biopsy followed by vaginal and intracavitary radium irradiation of the uterus. From 6 weeks to 2 months later the second stage is carried out. This consists of an exploratory laparotomy for the purpose of procuring the lymph gland specimens to permit evaluation of the extensiveness of the pelvic operation to be carried out. The classical Wertheim operation is carried out only on aged and obese women; in all the others either a Tailhefer (in instances in which the lateral groups of pelvic lymph glands are found not to be invaded) or a lymphadenocolpohysterectomy, with toilet of the posterior lymphatic system as high up as the promontory, is done. The third stage consists of systematic, transpelvic roentgen irradiation therapy. However, if the exploratory examination of the lymph glands in-

dicates that they are not invaded the roentgen therapy may be omitted.

For the cancers in stages III and IV no regular procedure has been adopted. If a total or partial en bloc removal appears to be indicated, preliminary radium irradiation is omitted; this rejection of radium therapy is based on the belief that such a method is apt to render the re-implantation of the ureters more difficult. This enlarged operation is, however, followed by roentgen therapy; indeed, if it is believed that a partial posterior pelvectomy or a simple toilet of the pelvis is feasible, the x-rays are used preliminarily, and radium therapy is at times added, following an electrocoagulation, especially in those instances in which infection appears to be severe. For stage 0, conization is done or total hysterectomy, as circumstances dictate; in this the age of the patient plays an important role.

On the whole, most of the operations on the author's service have consisted of the Tailhefer operation or their enlarged type of operation, the choice between the two being rigidly controlled by the preliminary exploratory examination of the lymph glands. In the first instance in which the 'second look' reintervention was decided upon the procedure eventuated in a total pelvectomy. All of the patients have withstood the operative work and are in excellent condition.

In the treatment of cancer of the breast it is the author's opinion that the poor or mediocre results of surgery have been due to the efforts of the surgeon extending in the wrong direction, that is, they followed the lymphatic system around into the axilla and neglected the direct route along the internal mammary artery. When this last route is overlooked the eventration of the axillary cavity is useless. The author was the first in France to resect 3 costal cartilages, but others have preceded him (Handley and Thackeray in England, Wangensteen and Adair in the United States, Margottini and Buccalosi in Italy, and Dahl-Iversen and Sorensen in Denmark) in using the same logical assumptions, to-wit: the internal mammary ganglionic chain is involved in 3 cases of 5 in which the cancer is located in the external quadrant of the mammary gland, and in 1 of 3 instances in which the internal quadrants are the ones involved.

In this method of procedure one fact stands out encouragingly. The internal mammary toilet does not seem to worsen the prognosis as compared with the classic mastectomy operation; the mortality with this procedure as done by the majority of surgeons has been nil. The first patient operated on by the author with the addition of the internal mammary toilet is now living and well after 3.5 years. The author thus believes that the minimal extent of the operation for cancer of the breast is the classic mastectomy with double toilet, viz., that of the internal mammary gland and that of the axilla.

Wangensteen now does a triple toilet, that is, he resects, in addition to the costal cartilages, a portion of the sternum and the internal mammary gland system of the opposite side. However, the author thinks that violence is being done to the principle of controlled operative enlargement.

The present method of treatment of mammary cancer at Grenoble, France, consists in immediate surgery, except in those instances in which the condition is progressing rapidly or in which the malignant nature of the tumor is evident. Such patients receive preoperative irradiation therapy. The operation itself (following preoperative biopsy) follows the principles given previously. When the preoperative examination of the lymph glands discloses the fact that one of these groups of lymph glands (axillary and internal mammary) are involved the exeresis of the gland en bloc is extended to include the excision of the supraclavicular glands, without, however, resection of the clavicle (Wagensteen does a resection of the clavicle); however, when the supraclavicular glands are clinically found to be involved, the en bloc mastectomy is extended to include the triple lymphatic toilet with resection of the medial half of the clavicle.

In all instances postoperative roentgen irradiation is employed; however, the author believes that in instances in which no glands are found to be involved this may be dispensed with. In the one patient operated by the author with this extensive procedure, the apparently hopeless condition was so modified that the patient has now remained in excellent physical condition for 2.5 years.

Here, again, in the instances of cancer of the breast the surgery employed has not eventuated in a single death. Two instances of lacerated pleura were without grave consequences and there were only two complications (pleurisy and double bronchopneumonia) in neither of which could any injury to the pleura be determined.

Finally, the author describes a minor modification of his method: instead of immediately resecting the costal cartilages, he doubly sections them, leaving them attached to the pectoralis major muscle; thus they are later resected en bloc along with the breast and other tissues.

Of course, the author does not neglect the hormones, particularly in the instances of cancer of the breast with its peculiar response to prolactin. In the young woman who has not reached the age of the menopause, castration is always indicated. This is more important since it is known that in 10 per cent of instances tiny cancerous metastases are encountered in the ovaries. It is perhaps as well to precede the castration by irradiation therapy directed at the hypophysis (Perrault) in order to inhibit the production of prolactin. Androgens for the young woman and estrogens for the aged are not to be overlooked. Their discussion, however are beyond the scope of this article.

The author admits that there are fulminant types of cancer in which it is better not to do any surgery at all; the methods here discussed are for the so-called normal cancer with local evolution (Redon), that is, which spreads slowly and invades particularly the lymphatic regions. —*John W. Brennan, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

The Cytologic Diagnosis of Carcinoma of the Fallopian Tube. Yo Seup Song. *Am. J. Obst.*, 1955, 70: 29.

Well preserved tumor cells may be desquamated from the surface of the ovary in the case of ovarian carcinoma, or from the tubal mucosa in primary car-

cinoma of the uterine tube. These cells may be carried through the lumen of the tube by peristalsis or ciliary movement, or both, and then through the uterine canal to appear in vaginal secretions.

A case is described in which malignant tumor cells were identified in the stained smears of vaginal secretions which were examined as a routine procedure at necropsy. Complete examination revealed a primary adenocarcinoma of the right fimbriated extremity of the fallopian tube. This diagnosis had not been suspected during life. There was no evidence of tumor in the endometrium nor in the cervix.

The appearance of tumor cells in vaginal smears in extrauterine carcinomas is rare. Papanicolaou mentioned cases in which the smears showed numerous compact or oval cells when the atrophy was pronounced. The appearance of these large, oval, more basal cells in the smears resulted from a thinning of the epithelium with the absence of a well developed superficial zone. The presence of such cells, however, without evidence of primary tumor in the cervix or endometrium, is strongly suggestive of a primary site in the uterine tube or ovary. In these cases careful and complete investigation of the entire generative tract is mandatory. —*Alan Rubin, M.D.*

Malignant Transformation of Endometriosis; Considerations in 2 Cases of Adenocarcinoma of the Ovary Arising from Endometriosis (Le trasformazioni maligne delle endometriosi; considerazioni su due casi di adenocarcinoma su endometriosi). Giuseppe Mancusi-Materi. *Gior. ital. chir.*, 1955, 11: 101.

The author discusses the sites where endometriosis has been found and quotes the Mayo Clinic series in which 64.9 per cent were found on the body of the uterus and 3.6 per cent were found on the ovaries.

Usually the endometriomas are in phase with the functional state of the endometrium, but sometimes this morphofunctional correlation is lacking. The occasional endometrioma does not regress after castration.

Endometriomas have been known to undergo malignant change. A few authors have reported clearly defined transitional zones. Among them is Corner, among whose 889 cases of ovarian endometriosis were 6 cases of adenocarcinoma apparently arising therefrom.

The author describes 2 cases of ovarian endometriosis with typical histories. The salient feature of each case was the microscopic picture.

In the first case, the endometrioma was seen to be mostly of the ordinary type in the proliferative phase, but there were a few areas which tended toward cystic dilatation, sometimes surrounded by inflammatory elements. Extending from these areas there was a gradual increase in hyperplasticity with irregular adenomatous processes blending into areas with increased atypism, marked invasiveness, and other features of malignancy.

The second case was quite similar; there was a zone of gradual change from a benign to a malignant condition—from typical endometrial zones with a few hyperplastic glands to frankly malignant areas with atypical mitoses and gradual disappearance of the glandular architecture.

These tumors resemble the typical adenocarcinomas arising from the endometrium with elliptical nuclei radially placed around the tubules.

—*W. Newlon Tauxe, M.D.*

Carcinoma of Gärtner's Duct; a Vaginal Case. Torf Wahlén and Inge Gynning. *Acta obst. gyn. scand.*, 1955, 34: 120.

Primary cancer of the vagina is reported to comprise from 0.5 to 3.7 per cent of all female genital cancers and is nearly always of the squamous type. If the histological structure does not represent squamous carcinoma it is believed that the tumor then may be derived from remains of the wolffian duct, which may occasionally persist throughout life, or may appear as Gärtner's ducts. The histology of these rudiments varies according to their location in the uterine wall, the cervix (ampullar section of the duct), or the vagina.

Since R. Meyer's (1903) first description of a case of carcinoma of Gärtner's duct, some 40 proved or probable cases have been reported, the majority of them occurring in the ampullar area. If these carcinomas are found in the vagina, the patients are usually children. Only 3 vaginal cases in adults have been reported so far, and the authors present a fourth one in this article.

The patient, a 38 year old gravida 4, was operated upon for a cyst of Gärtner's duct in the right lateral vaginal wall, but the tumor could not be completely removed at the time of surgery. It was found to infiltrate into the parametrium and was diagnosed as carcinoma on frozen section. The patient was then irradiated with radium and x-rays, and 2 months later was subjected to a classical Wertheim operation.

The microscopic structure varied from low cuboidal epithelium with colloidal masses in the form of follicles invading the muscle, to cellular masses resembling packed cylinders with some inflammatory elements. The patient was well 3 years after surgery.

—*W. D. Bergman, M.D.*

EXTERNAL GENITALIA

Carcinoma of the Bartholin Gland; Review of the Literature and Report of a New Case in an Elderly Patient Treated by Radical Operation. John G. Masterson and A. Sidney Goss. *Am. J. Obst.*, 1955, 69: 1323.

During the period from 1864 (Klob) to 1939, 38 cases of primary carcinoma of the Bartholin gland were reported; 79 cases have since appeared in the literature, most of them in single case reports. It is doubtful whether this indicates a real increase in the incidence. Crossen estimates the incidence of carcinoma of the Bartholin glands as 2 to 3 per cent of all carcinomas of the vulva, and approximately 1 out of every 1,000 female genital cancers. Including the present interesting case, a total of 117 primary carcinomas of the Bartholin gland have been reported to date. In the majority of cases the condition occurs between the ages of 41 and 60. The symptoms are nonspecific, often falsely related to abscesses of the Bartholin gland, although infection does not seem to be an important factor in the disease.

A total of 48.6 per cent of these neoplasms were adenocarcinomas, 45.8 per cent were epidermoid carcinomas, and the remainder consisted of 5 sarcomas, 1 melanoma, and several undiagnosed tumors. The high number of epidermoid cancers is probably due to the fact that during the course of chronic inflammation squamous metaplasia is quite frequently encountered deep in the gland. In order to differentiate this entity from carcinoma of the vulva it is necessary to establish the following four criteria: The tumor (1) must be at the anatomically correct site, (2) must be deep in the labium, (3) have an intact overlying skin, and (4) have elements resembling glandular tissue. Several methods have been employed in the treatment of this tumor, but the survival rate appears to be only around 10 per cent.

The authors report the case of an 83 year old colored female who had a 5 weeks' history of bleeding with a tender mass in the vulva. Biopsy of a 3 by 2 cm. mass at the site of the Bartholin gland revealed an epidermoid cancer. Three weeks after radical vulvectomy an inguinal, femoral, and pelvic lymphadenectomy was done. The authors recommend the surgical approach in the treatment of these lesions since the results of radiation have been consistently poor in carcinoma of the vulva.

—W. D. Bergman, M.D.

MISCELLANEOUS

Venous and Lymphatic Intravasation in Hysterosalpingography. F. ZACHARIAE. *Acta obst. gyn. scand.*, 1955, 34: 131.

SINCE the introduction of lipiodol in 1922, for the purpose of salpingography, the risks of the method were found mainly to be activation of a latent infection and oil embolism through uterine and pelvic vessels. Béclére, in 1926, showed that the radiopaque medium might enter the capillaries and veins in case of endometrial damage or high pressure. Today, about 200 cases of venous or lymphatic intravasation have been reported. Usually this event is asymptomatic, but may give rise to backaches, malaise, dyspnea, and cough when it reaches the lungs, and occasionally the full picture of pulmonary infarction. Thus far, 3 deaths following hysterosalpingography have been reported.

The authors performed 560 hysterosalpingographies at their Copenhagen hospital during the years 1944 to 1953; water-soluble media were used in 55 of these and iodized oils in the remainder. Intravasation occurred in 11 of these cases, one of them with a water-soluble substance. The injection was done with a Stille apparatus, without manometric control, but fractioned, under fluoroscopic control. The cases of intravasation are reported in detail. The reasons given for this complication were that the procedure was done too soon after menstruation or curettage, with too high a pressure in the presence of a partially obliterated uterine cavity; with the use of too much opaque medium; in the presence of decidual reaction in the tube; tubal pregnancy; and fibrosis uteri. The mode of intravasation into the veins is frequently clearly shown in the roentgenogram. Occasionally the lymphatics are filled, and then the medium will not advance beyond the pelvic or paravertebral lymph nodes, and may be visible there for years.

The authors believe that the use of oil should be abandoned and that water-soluble media only should be used. Manometric control is important, but limiting the pressure to 300 mm. or even 200 mm. of mercury does not protect against intravasation. If a well trained second physician is available, fluoroscopy will aid in the early detection of intravasation. It is further important that the endometrium be entirely intact and that it is not injured by too long an instrument. If the procedure is undertaken on the seventh to fourteenth day of the menstrual cycle, or at least one week after curettage, the endometrium will be properly regenerated, and the mucosa will not yet show the increased permeability of the lutein phase. Great care must be taken after all surgical procedures and in the presence of any pathologic condition of the uterus.

—W. D. Bergman, M.D.

Paracervical Uterine Denervation by Transection of the Cervical Plexus for the Relief of Dysmenorrhea. JOSEPH BERNARD DOYLE. *Am. J. Obst.*, 1955, 70: 1.

TRANSECTION of the cervical division of the Lee-Frankenhauser uterovaginal plexus lying in, around, and under the terminal 2.5 cm. of the uterosacral ligaments permits sensory denervation of the cervix and fundus of the uterus and the proximal segment of the tubes. The procedure may be done during laparotomy or culdotomy.

Neuromuscular and neurovascular autonomic imbalance is avoided since both sympathetic and parasympathetic pathways are interrupted.

Relief of acquired dysmenorrhea, with or without antecedent primary dysmenorrhea was obtained in 69 of 73 cases (94.5 per cent). Complete relief was obtained in 63 cases (86.3 per cent); in 30 of 35 cases of aggravated primary dysmenorrhea (85.7 per cent); and in 33 of 38 acquired cases of secondary dysmenorrhea (86.8 per cent). Partial relief was obtained in 6 cases (8.2 per cent). There were four failures (5.5 per cent). No interference with function of the bladder or rectum occurred.

Regrowth of the nerves is prevented by interposition of the posterior parametrial peritoneum between the transected uterosacral ligaments and the top of the vagina.

—Charles Baron, M.D.

On the Behavior of the Urethrovesical Relationship in the Schauta-Wertheim Interposition for Cystocele with Urinary Incontinence; Cystourethrographic Study (Sul comportamento dei rapporti uretro-vescicali nelle operate di interpositio alla Schauta-Wertheim (I.S.W.) per cistocele con incontinenza urinaria. Studio cisto-uretrografico). SERGIO STEFANELLI. *Ann. ostet. gin.*, 1954, 76: 1209.

THE AUTHOR discusses the urethrovesicular relationship in patients treated for cystocele and urinary incontinence by the Schauta-Wertheim interposition operation, which is frequently used in menopausal patients with uterine prolapse as well. The technique used was based on Fasiani's concept that the most realistic cystourethrograms are obtained when taken during the act of micturition of a bladder filled to the point of urgency with a 20 per cent barium sulfate

solution. The patients were made to void in the erect position and the roentgenograms were taken by oblique projection (Migliardi's technique). Films were taken preoperatively and postoperatively after 15 to 20 days. There was no difference noted in the quantity of solution necessary to provoke urination in the preoperative and postoperative examinations.

The normal posterior urethrovesicular angle is usually about 90 degrees. In incontinency it is usually around 180 degrees, i. e., in the former the urethra is vertical and in the latter, horizontal.

The anterior angle is obtuse while it is acute in incontinence.

The authors present 8 cases in detail with preoperative and postoperative cystourethrograms. All presented the urethrovesicular abnormality described, which was accompanied by a lowering of the vesicular fundus and dilatation of the urethra. All of the patients were cured by the Schauta-Wertheim interposition operation.

The author stresses six points which should be looked for in such cases: (1) the anterior angle, (2) the posterior angle, (3) the relationship of the amplitude between the two, (4) the direction of the urethra, (5) the urethral caliber, and (6) the level of the vesicular *bas fond.* —*W. Newlon Tauxe, M.D.*

Considerations Relating to Meigs' Syndrome (Consideraciones en torno al sindrome de Meigs). E. JUNCEDA AVELLO. *Rev. españ. obst.*, Valencia, 1955, 12: 17.

IT WAS NOT UNTIL 1937 that the triad of ovarian fibroma, ascites, and hydrothorax became defined as a syndrome by Meigs; however, Demons in 1910 gave a description sufficiently adequate to merit the designation of Demons-Meigs syndrome. There are several allusions in the literature dating back to the observations of Spiegerberg in 1866.

Other tumors have been described to produce this picture: Brenner, granulosa-cell, and theca-cell tumors, multilocular cystadenomas, struma ovarii, and adenocarcinomas. These should be called atypical forms, and the term "typical forms" should be reserved for the fibroma-induced picture. However, only benign or relatively benign tumors should be considered in the atypical forms.

Funck-Brentano had distinguished between complete and incomplete forms while Otero Soto has written of hemorrhagic forms and those associated with malignant tumors.

These terms lead to confusion. To avoid this we must consider three criteria necessary to categorize true Meigs' syndrome:

1. The ascitic and pleural fluids must be of the same chemical nature (transudate) and the same yellow color, and they must be free of erythrocytes and tumor cells.

2. The tumor must be benign.

3. Hemorrhagic fluid should be excluded since this is almost pathognomonic of malignancy. Flabeau's case was a notable exception; however, in this there was sanguinous pleural and abdominal fluid associated with a benign polycystic folliculoma and the condition was cured by oöphorectomy.

The incomplete forms do not represent the true syndrome. Occasionally only hydrothorax will be evident on examination, but some ascites will always be evident at laporatomy. If hydrothorax is lacking then the case does not belong in this category since some abdominal fluid is associated so frequently (in from 40 to 75% of the cases) with ovarian tumors, especially fibromas.

In general, malignant forms should not be considered since Meigs' syndrome basically is a benign process, although several cases with malignant characteristics have been reported in the literature.

We have seen a case of this type, a carcinoma developing in a degenerating cyst, i.e., a malignant condition occurred in the case, that of a 51 year old woman who presented herself with ascites (1,500 c.c.), hydrothorax (1,500 c.c.), and a large pelvic mass. On laparotomy bilateral ovarian multilocular cysts the size of fetal heads were observed. Removal of the uterine tubes and ovaries was carried out.

Histologically, the ovarian tumors presented the picture of ovarian adenocarcinoma arising from cysts of both ovaries.

Postoperatively the patient was given 6,497 roentgens and she has remained apparently free from disease on several subsequent control visits.

In some cases in the literature the ovaries are not involved: uterine leiomyomas, ascites, and hydrothorax.

Meigs' syndrome is rare. Only 44 cases were in the literature in 1947. Now there are about 100 cases. It is a very important diagnosis to make as the patients can be cured. The condition may be mistaken for inoperable cancer and then the patient dies from hypoproteinemia.

There are several theories of ascitic fluid production: it may be due to (1) heart failure, (2) peritoneal irritation, (3) cuboidization of capsular epithelium (if it fills up cysts it may fill up the abdominal cavity), (4) a simple defense reaction, (5) histamine toxicosis (anaphylactic), (6) compression of abdominal lymphatics, (7) circulatory disturbance (torsion of pedicle), (8) hormonal factors (tumors produce estrogen analogues), and (9) capillary permeability increase.

There are several theories of pleural fluid production: it may be due to (1) Meigs syndrome (fault of thoracic drainage with congestion of the azygos vein —explains only right hemithorax lesions), (2) lymphatic system crossing the diaphragm, i.e. hydrothorax secondary to ascites; the rate of reabsorption may be better in the pleura than in the peritoneum, (3) block of the transdiaphragmatic lymph flow by chronic inflammation (Recklinghausen, Lemon, and Higgens).

None of these theories is entirely convincing and does not explain all of the cases.

Clinically, Meigs' syndrome occurs from the third to the fifth decades of life, usually with a long vague history with diverse complaints accented by digestive and respiratory complaints.

The diagnosis is simple; it must come to mind. The tumors may be large or small; the hydrothorax is usually on the right side.

The treatment is oöphorectomy or, if impossible, roentgen therapy. Preoperative medication should include mercurial diuretics and a salt free diet.

—*W. Newlon Tauxe, M.D.*

Choriocarcinoma; a Report of 2 Cases with Unusual Features. JOHN PEEL, JOHN DAWSON, and GORDON MATHER. *J. Obst. Gyn. Brit. Empire*, 1955, 62: 232.

TWO CASES of choriocarcinoma are presented. In the first case, no primary growth could be found at autopsy, and in the second, the Aschheim-Zondek test was persistently negative and the growth apparently remained localized in the uterus for a period of nearly 2 years.

The difficulty in the diagnosis of choriocarcinoma was pointed out. In 13 cases of choriocarcinoma appearing in the literature, the Aschheim-Zondek tests were negative, and in 2 others they were weakly positive. It is conceivable that (1) the carcinoma may be too small; (2) the growth may be surrounded or damaged by hemorrhage interfering with the elaboration and absorption of the gonadotropin; and (3) in some cases in which the tumor is widespread the cells may not produce as much hormone.

The history of miscarriage of pregnancy followed by persistent uterine bleeding and enlargement is very suggestive of choriocarcinoma even when the curettings are doubtful and negative biologic tests are obtained.

These patients should be carefully watched with quantitative Aschheim-Zondek tests. In neither of the cases mentioned was the standard treatment of surgery followed by irradiation successful. One of the patients received large doses of estrogen in the hope of suppressing the growth of the chorionic tissue without any noticeable results. —*James F. Donnelly, M.D.*

Diverticula of the Female Urethra; Review; New Procedure for Treatment; Report of 5 Cases. EUGENE A. EDWARDS and ROBERT A. BEEBE. *Obst. Gyn.*, 1955, 5: 729.

A NEW surgical procedure for the repair of diverticula of the female urethra is presented. The method consists of separating the vaginal mucous membrane and fascia overlying the diverticulum and floor of the urethra. The urethra is incised from the external urethral meatus to the site of the opening of the diverticulum into the urethra, and the diverticulum is then excised. The urethra is repaired over a catheter placed in the urinary bladder through the proximal third of the urethra, which has not been incised.

The authors present the histories of 5 patients who were treated successfully in this manner and followed for periods of 3 to 13 years.

A review of the literature is presented, which shows that there is no consensus regarding the mode of origin of diverticula of the female urethra; they may be either congenital or acquired. Both conservative and radical methods of treatment are discussed. The operative treatment described herein is classified as a radical method of treatment. —*Alan Rubin, M.D.*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Eclampsia and Its Prognosis (A propos de l'éclampsie et de son pronostic). JORGE DE REZENDE. *Rev. fr. gyn. obst.*, 1955, 50: 165.

THE AUTHOR discusses eclampsia and its prognosis from the standpoint of a review of the literature and a repetition of his own experiences. Since, however, a portion of this material was originally published in sources which perhaps do not receive adequate notice by English language reviewers a few figures may be here included.

The author, together with Figueiredo, proposed in 1940 (*Rev. gin. obst.*, Rio, 1940, 34: 3), a classification of the toxemias of pregnancy on the basis of the symptomatology. This grouping was suggested by that of Eden (*J. Obst. Gyn.* Brit. Empire, 1922, 29: 386) as later modified by Peckham (*Am. J. Obst.*, 1935, 29: 27).

This classification, appurtenant to the Brazilian material, consists of the following 11 divisions: (1) pulse equal to, or above, 120; (2) systolic blood pressure superior to 200 mm. Hg; (3) extensive edema; (4) massive albuminuria; (5) oliguria; (6) marked motor agitation and psychic excitation; (7) temperature above 39.5 degrees C.; (8) icterus; (9) marked and persistent coma; (10) visual disturbances; and (11) number of crises more than 20.

The 5 last mentioned elements are considered to be of especial gravity. The condition is considered to be of benign character when none of these elements is present or when not more than one can be detected. When two are present the condition is considered as grave and when more than 4 are present it is considered as very grave. When any of the 5 last mentioned symptoms are present, the prognosis is considered to be somber; this is what has been designated as "deviation downward," or deviation toward the bottom of the list, and presages immediate demise.

On the basis of the Eden-Peckham classification at that time the tentative figures for the Brazilian material were as follows; benign cases (25) afforded a mortality of 0; and grave cases (37) gave a maternal mortality of 27 per cent. Under the Rezende-Figueiredo classification the following figures were obtained: benign cases (41) with no maternal deaths (fetal deaths 3); grave cases (23) with no maternal deaths (fetal deaths 7); and among the very grave cases (18) the maternal deaths amounted to 14 (fetal deaths 9).

It would require too much space to explain how this material was selected for purposes of comparison; it is merely important that it would seem to show the greater number of brackets included in the author's classification is necessary if the fate of the mother and child is to be adequately considered.

With respect to the ultimate fate of the mother the author quotes extensively from other workers (mostly English, American, French, and German), ending with the masterful report of Finnerty (*J. Am. M. Ass.*, 1954, 154: 1075) who makes such a sharp distinction in the matter of ultimate results between those toxemic conditions which are engrafted upon an already existing cardiovascular hypertensive disease, as shown by pregravid pathology of the eye grounds, and pure cases of toxemia of pregnancy.

In this respect the author has made a study of 400 hypertensive pregnant women (6.6 per cent of 6,000 assisted at labor) of which 182 (45.5%) had preeclampsia and 13 (3.25 per cent) had eclampsia. In this group of hypertensive pregnancies the author includes those with the eye ground findings of cardiovascular hypertensive disease and those with the urinary findings of renal disease (nephrosclerosis). The maternal mortality in the group with the combination of hypertensive disease plus gravid toxemia was 1.4 per cent and in the group with renal disease plus gravid toxemia the maternal mortality was zero.

Based on his personal experience, the author notes that the incidence of recurrence of the toxemia of pregnancy in subsequent pregnancies may be estimated at 5 per cent, and this despite adequate prenatal assistance. This figure he attributes to the persistence of the hypertensive phenomena from the previous attacks. Since the hypertension consecutive to gravid toxemia may at times exhibit a malignant development, he believes that surgical treatment is indicated. Surgical treatment is peculiarly efficacious and permits a new pregnancy without special danger of toxemia (Newell and Smithwick: Pregnancy following Lumbodorsal Splanchnicectomy for Essential and Malignant Hypertension and Hypertension Associated with Chronic Pyelonephritis. *N. England J. M.*, 1947, 236: 851; SURG. GYN. OBST., INTERNAT. ABST. SURG., 1947, 85: 544). —*John W. Brennan, M.D.*

Supportive Care, Interruption of Pregnancy, and Mitral Valvulotomy in the Management of Mitral Stenosis Complicating Pregnancy. CURTIS L. MENDELSON. *Am. J. Obst.*, 1955, 69: 1233.

CARDIAC DISEASE is today the single greatest cause of maternal death at the New York Lying-In Hospital. Severe mitral stenosis is largely responsible for this mortality.

The onset of cardiac decompensation and the time of death can be definitely related to the predictable hemodynamic burden of pregnancy. It is this burden rather than the natural course of rheumatic heart disease which accounts for the vast majority of maternal deaths, all statistics pertaining to age at death in rheumatic males and females notwithstanding. Childbearing does not shorten life expectancy in rheumatic heart disease provided the patient survives the hemodynamic burden of pregnancy.

Cardiac catheterization is well tolerated during pregnancy. In selected cases it offers a direct and accurate method of appraising the extent of mitral stenosis and cardiac reserve.

Every case of mitral stenosis during pregnancy must be carefully individualized. Supportive therapy, therapeutic abortion, and mitral valvulotomy each

play a definite role in the present concept of the problem. None is a panacea.

The obstetric ideal of obtaining a living mother and a living baby is most logically approached by improving the ability of the heart to withstand the burdens of pregnancy.

The ability of the heart to withstand gestatory burdens can be best evaluated if the benefits of valvulotomy are fully determined prior to pregnancy.

Mitral valvulotomy can be successfully performed ante partum. Pregnancy does not increase the operative mortality of mitral commissurotomy. The danger of premature labor following valvulotomy is not significant.

Valvulotomy during pregnancy requires special consideration in terms of inoperability, mitral insufficiency, irreversible pulmonary vascular changes, carditis, progress of hemodynamic improvement, valvular refusion, and auricular fibrillation. These hazards are at present more apparent than real.

The recorded experiences indicate that mitral commissurotomy prior to and during pregnancy favorably influences maternal and fetal mortality.

Clinically recognizable carditis is an extremely rare complication of pregnancy and has not occurred in the author's cases of severe mitral stenosis.

Obscure rheumatic activity as suggested solely by elevated c-reactive protein level and the presence of Aschoff bodies in the auricular appendage has not interfered with the success of valvulotomy where the hemodynamics had been altered by mitral stenosis.

Carditis, clinical or latent, has not been a factor in maternal mortality.

Women in the childbearing age with mitral stenosis are not likely to have valvular calcification which would interfere with the success of commissurotomy.

Accepted concepts of antepartum, intrapartum, and postpartum management of patients with mitral stenosis are not altered by valvulotomy except that indications for therapeutic abortion and sterilization are decreased.

Sterilization need no longer be considered an accessory to the interruption of pregnancy.

Cardiac surgery has made childbearing possible for women heretofore doomed to barren marriage by severe mitral stenosis. —*Charles Baron, M.D.*

Cancer of the Cervix and Pregnancy (Cancer du col et grossesse). J. MAGENDIE, CHASTRUSSE, MEYNARD, and SOUMIREU. *Bordeaux chir.*, 1954, p. 169.

FIVE INSTANCES of cervical cancer are reported. These case histories are appended merely to show that the neoplastic condition under consideration is adversely affected by delivery through the natural passages. A sixth case history is later appended to illustrate the difficulties encountered in the attempt to diagnose and properly evaluate cancer in situ.

An odd impression is obtained that in the actual detection of the presence of very early cancer, more dependence is placed by the authors on the Papanicolaou test than on biopsy; certainly they have more confidence in this test than in the simple examination of the cervix with the colposcope and in the test of Schiller. With biopsy, the danger is that the specimen may be taken from the immediate neighborhood of an invasive microcancer and thus miss recognition ("Randbelag" of the German authors). If the biopsy is to be depended upon it should be done a number of times at various locations, and at intervals of 2 or 3 weeks. In the sixth case reported, in the face of various diagnoses of early malignancy (Hinselmann IVb), the woman refused all treatment, became pregnant (the third time), delivered a healthy child at 8 months, and 2 years later was in excellent health. The authors recommend that the Papanicolaou test be made a routine procedure.

The treatment of the cervical cancer in pregnancy varies at Bordeaux, France, with the progress of the pregnancy itself. In the period before viability of the fetus the authors prefer to start with irradiation therapy; they think that surgery should not be undertaken before procuring the effects from radium treatment of the uterus itself and the regional cellulolymphatic territories. In the matter of roentgen therapy, the authors have not yet decided upon the optimal time for its utilization, that is, whether before or after surgery.

During the period when the fetus is viable, extraction of the child by cesarean section is absolutely mandatory. With the uterus evacuated, the treatment continues in the same fashion as in the instances of cancer without accompanying pregnancy.

In the cancers appearing, or discovered, during the puerperium the prognosis is particularly grave, and the difficulty of determining the degree of extension limits considerably the surgical possibilities. Here again the authors prefer to begin with irradiation therapy, followed by surgery directed toward the ganglia and cellulolymphatic tissues in general.

At the Service of Gynecology at Bordeaux, France, they are partisans of the combined irradiation-surgical treatment of all stage I and II cervical cancers and they see no reason to change their attitude when dealing with the cervical cancer of pregnancy. Always, the irradiation is applied first to avoid preoperative metastatic dissemination. The best time to operate is considered to be about 3 months after the termination of the irradiation therapy. The surgery usually employed is in essence that practiced by Meigs of Boston, Massachusetts, with some modifications in detail. These consist essentially in excision en bloc of all the cellulolymphatic tissues of the presacral, external and internal iliac, and obturator regions, together with the parametria, adnexae, uterus, and a broad collar of the proximal portion of the vagina. Of course, in the stages too advanced for surgery, irradiation therapy is all that remains. Radium therapy permits of extending operations (Wertheim) to women who are aged, obese, or physically depressed, and who previously were not operable.

In the matter of irradiation therapy, there is also much difference of opinion, even among the authors themselves: Magendie always prefers to commence with radium treatment, operating 3 months later, and then following the operative work with roentgen therapy. Meynard, on the other hand, rejects the complementary surgery, and reinforces the action of the rays to a maximum. He prefers to begin with the roentgen rays, in order to have better conditions locally when it is time to apply the radium.

In the nonviable infant, the 50 mgm. intracervical applicator for a period of 7 days will be apt to produce an abortion. The roentgen therapy, as a complementary application to the radium, consists in the administration of 3,000 to 4,000 roentgens in a period of a month and a half. This amount of irradiation practically leaves no chance for survival of the fetus. This, of course, creates another problem, a balancing of the advantages of sufficient irradiation treatment without consideration for the fetus, against those of survival of the fetus at the cost of insufficient irradiation.

With a viable fetus, following the cesarean operation, the treatment begins immediately and does not differ from that of the nonpregnant state; the treatment begins with roentgen therapy and continues with radium.

In the puerperium, the treatment begins immediately with roentgen irradiation; this produces an immediate attack on the malignant condition, permits the involution of the puerperal organs, and prepares the way for the radium.

Finally, the authors allot a few words to the subject of the treatment of the stage O cancer (the intraepithelial or in situ cancer). The time elapsing between the extremely difficult diagnosis and the period when invasion begins may be several months, frequently several years (Payne, Stevenson); indeed such an invasive stage is not necessarily certain (Wespi). Thus the authors tend to subject the pregnant woman to surveillance (smear examinations and biopsies) and only to intervene after the delivery. The only justification for immediate therapy is a truly invasive histological finding, following the interpretation of a sufficiently inclusive (deeply extending) biopsy specimen. In this latter instance immediate intervention is indicated, even if the lesion be of extremely limited extent (microcancer of Westwerdt). However, this is done only after the diagnosis has been confirmed by several qualified pathologists who are familiar with the deceptive aspects of the spinocellular and basocellular epitheliomas during the course of pregnancy.

—*John W. Brennan, M.D.*

Cancer of the Body of the Uterus; Statistical Material of 380 Cases (Cancer du corps de l'utérus. Statistique de 380 cas). P. Brocq, A. Tailhefer, and Sakka-Amini. *Gyn. obst.*, Par., 1955, 54: 125.

A statistical material of 380 instances of uterine corpus cancer is discussed. Of these cases 157 were from the Curie Foundation (A. Tailhefer) and from the personal practice of P. Brocq, and 51 were from the practice of Brocq's previous assistants. Added to this number were 15 in which operation had been done elsewhere and they had then been referred to the Hôtel-Dieu (Curie Institute) for radium-irradiation treatment of the recurrence.

Of these patients, 341 had been treated by surgical exeresis, 22 by the application of irradiation therapy alone, and 2 by preliminary irradiation treatment followed by surgery.

Of the 341 patients under surgical treatment, 217 could be traced after periods of from 5 to 28 years. Of the 217, 139 were in excellent health after 5 years or more. This, of course, postulates a proportion of 5 year cures of 64 per cent.

Of these 217 patients, controlled for periods of 5 to 28 years, 162 had undergone a total hysterectomy with bilateral castration. Of this number 110 were apparently cured after periods of 5 years or more (68 per cent), 15 had been subjected to subtotal hysterectomies (usually the result of a mistaken diagnosis) with 8 apparent cures (53 per cent), 12 had been operated on by the vaginal (10 cases) or perineal (2 cases) routes with 5 survivals, and 20 have now been subjected to the enlarged hysterectomy operation with colpohysterectomy and excision of the regional cellulolymphatic tissues of the pelvis. This material comprising 20 cases gave 16 (80 per cent) 5 year survivals. Finally, there were a total of 8 exploratory laparotomies.

From the standpoint of the stage of development of the tumor, 116 were in stage I, with 86 survivals for 5 years or more (74 per cent); 39 tumors were in stage II with 26 survivals (72 per cent); 36 were in stage III with 21 survivals (55 per cent); and 24 were in stage IV with 6 survivals (24 per cent).

With reference to the histologic type of tumor, 147 were typical cylindrical epitheliomas with 105 survivals (71 per cent), 62 were atypical cylindrical epitheliomas with 32 survivals (52 per cent), 7 were pavement cell epitheliomas with only one survival, and there was one case of epitheliosarcoma which had survived.

Anent the period of life when the operation was performed, in the 26 to 40 age group, the survivals amounted to 72 per cent; in the 41 to 50 age group also 72 per cent, in the 51 to 60 age group 67 per cent, in the 61 to 70 age group 59 per cent, and among the 15 patients operated on who were more than 71 years of age 6 survived.

As these figures would indicate, the authors prefer the operation of colpohysterectomy with excision of the pelvic cellulolymphatic tissues of the pelvis in all the cases in which the age and general condition of the patient permit, or in which the degree of development of the lesion, the diminished mobility, and volume of the uterus, or the extension of the neoplasm as shown by hysterography, causes a suspicion of extrauterine invasion. The authors are cognizant of the objections to this radical procedure of other authors (Sénèque and Funck-Brentano). When their statistics were presented before the Academy of Surgery, November 10, 1954, these two last-mentioned authorities maintained that a distinction should be made between the cancers of the corpus uteri which are situated at the fundus or near one of the isthmuses, or which develop in the direction of the isthmus, and those located lower down. For the higher-placed lesions the simple total hysterectomy without an attack on the pelvic lymphatic apparatus was asserted to be sufficient.

The authors are not able to answer these critics statistically, for the reason that most of their material comes from a relatively remote period, the records frequently lacking an adequate account of the extent of spread of the lesion; however, the authors are not at all certain that even hysterography always permits a decision concerning the importance of the fundal

cancer and its evolution in the direction of the base of the corpus. It is impossible to say, before excision and histologic examination of the removed specimen, whether the cancer is still limited to the endometrium, or whether it has spread deeply to involve the myometrium. Moreover it is impossible to determine without histologic examination, whether the neoplasm is a typical cylindrical epithelioma, or an atypical type.

These considerations would seem to be sufficient to diminish the value of any distinction between the cancers of the isthmal region and those of the basal regions of the corpus; however, there exists in this regard another reason for rejecting such a distinction, a reason which was unknown to the authorities of the past. This reason lies in the fact that it is now known that the lymphatics of the uterine fundus do not course exclusively along the upper margin of the broad ligament, but many of them descend to empty, just as do the lymphatics of the cervix, into the broad lymphatic passages of the parametrium and external iliac lymph nodes.

Finally, one might mention that certain statistical compilations of the past include cases of doubtful malignancy, a fact which would naturally falsify the favorable percentages of results from simple total hysterectomy. —*John W. Brennan, M.D.*

LABOR AND ITS COMPLICATIONS

Painless Childbirth; Experiences with the Management of Labor and Delivery with Drugs and Pudendal Block in 1,000 Cases (Die schmerzarme Geburt; Erfahrungen mit der medikamentoesen Geburtsleitung sowie der Pudendusblockade bei tausend Gebaerenden). W. SPIELMANN. *Klin. Med.*, Wien., 1955, 10: 201.

MANY METHODS for pain relief in labor have been proposed and the author reviews the pharmacologic and physiologic backgrounds of some of them. His own preference is for some form of "medical" management of the discomfort of labor with pudendal block for delivery. He reports on 1,000 patients so treated with no untoward results. Although the author used piperidin derivatives, or apomorphine in subemetic doses during labor, the majority (more than 600 patients) were managed with trial (a sedative-analgesic mixture containing scopolamine). This particular combination was more consistently effective than the others.
—*Warren R. Lang, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Sarcoma of the Kidney in the Adult (Les sarcomes du rein chez l'adulte). J. CHOMÉ. *J. urol. méd.*, Par., 1955, 61: 33.

ALTHOUGH SARCOMAS OF THE KIDNEY are rare in themselves, they exhibit a certain disparity of incidence. They may be arranged in order of frequency into fibrosarcomas, pure or mixed (the most frequent); leiomyosarcomas; liposarcomas; rhabdomyosarcomas; sympathoblastomas and glioblastomas; osteoblastomas or osteogenic sarcomas, and lymphosarcomas and reticulosarcomas.

The fibrosarcomas are frequently quite large (10 cm. in diameter), usually quite firm and rounded or irregular in shape. They may, however, present hemorrhagic areas and may, in fact, become cystic. Histologically, the pure fibrosarcomas are constituted chiefly of fibrous tissue with perhaps an admixture of fibroblasts; when the fusiform fibroblasts give place to large, more stellate-shaped cells, the tumor becomes a histiocytosarcoma. As the histologic picture suggests, these tumors may show a decided sluggishness in their rate of growth and spread. Thus R. B. Henlein (*Am. J. Surg.*, 1941, 51: 408), Judd and Donald (*Ann. Surg.*, 1932, 96: 1028), and Mintz (*Ann. Surg.*, 1937, 105: 521) report what appear to be cures or, at least, long periods of survival.

The leiomyosarcomas are medium-sized, irregularly rounded, firm tumor masses, situated indifferently in the kidney. These peculiar neoplasms, with their admixture of smooth muscle fibers may also present hemorrhagic zones and, indeed, frequently exhibit areas of calcification.

The liposarcomas are so rare that, up to 1949, only 13 cases had been reported. The consistency of these tumors is softer, doughy, encephaloid, but well encapsulated. The color of the cut surface is yellow or yellowish gray. Microscopically, there is a fibrous tissue containing large fat cells with monstrous nuclei and a polymorphous appearance. Among these frankly neoplastic cells are observed normal lipoblasts and histiocytic macrophages. Despite the malignant impression made by these tumors, metastases are rare.

The rhabdomyosarcomas constitute the first type of tumor of this series which are generally classed as dysgenetic, that is, as arising from fetal inclusions. The authors consider these neoplasms as developing at the expense of the renal blastema in the myogenetic sense, from this totipotential tissue. Only a few such cases have so far been reported. Microscopically, there are typical striated muscle cells in a dense, fibrous stroma. There is little evidence of monstrosity formation or of atypical mitoses in these tumors and the malignant character must be inferred from the local invasive properties and the peculiar blood lakes which are considered to be characteristic of all types of sarcomas.

The sympathoblastomas possess all the histologic and clinical characteristics of the suprarenal sympathoblastomas. They are practically nonremovable without neurogenic shock and show the classical disposition "en rosette" of the small round cells or cubical cells of embryonic type.

The osteosarcomas are so rare that it is difficult to classify them. They may be considered teratomas or fibrosarcomas which have developed an osteogenic tendency. Histologically, the dense bands of calcification are seen to be composed of well differentiated bone tissue.

The lymphosarcomas and reticulosarcomas are composed of lymphoblasts with little evidence of monstrosity formation or of atypical mitoses and, here again, the malignant properties of these neoplasms must be inferred rather from the invasive and vascular disposition characteristic of the preceding types of sarcoma of this series. They seem to be the only type of sarcoma of the kidney which shows any considerable response to irradiation therapy; nevertheless, as in the most of the preceding types, the prognosis is not as favorable as in the other types of malignant tumor (carcinoma, hypernephroma). This particular type exhibits a rapid growth, recurrences are the rule, and death usually occurs within a few months.

On the whole, the sarcomatous nature of a tumor of the kidney may be suspected; however, it is very difficult to differentiate the type present. In fact, such differentiation is practically impossible without histologic examination, and yet such differentiation is important from the aspect of prognosis, if for no other reason (character of postoperative treatment), since it has already been mentioned that in fibrosarcoma of the kidney long survival, or even cure is a possibility. —*John W. Brennan, M.D.*

The Clinical Application of Hemostasis in Nephrotomies by Means of Implants of Muscle Tissue; Ultimate Results in 12 Cases (Applicazione clinica dell'emostasi con tessuto muscolare nella nefrotomia; risultati lontani di 12 casi). ANGELO ACQUATI. *Gior. ital. chir.*, 1955, 11: 425.

IN TWELVE PATIENTS, in whom nephrotomy was done, the kidney was closed with insertion of a muscle implant between the raw surfaces. The results immediately after the operation, and at periods of from one to two years later are reported.

In general the results were satisfactory, the wounds healed without complications of any consequence, with the exception of 2 instances. The first complication consisted of the development of extensive decubitus ulcerations over the buttocks and sacral region and the regions of the calcanei. The ulcers eventually cleared up and the episode is ascribed by the author to a lowered general resistance resulting from a latent lues which was acquired during the patient's youth.

The second complication occurred in a patient 48 years of age who had a large branched calculus filling the left renal pelvis. The stone was septic in character and there was a discrete functional deficiency of the

left kidney. The stone was removed by a left lumbar nephrotomy and the kidney incision was closed after the interposition of a muscle implant from the neighboring lumbar musculature between its raw surfaces.

The wound healed without difficulty; however, the urine became more and more purulent and the kidney had to be removed (nephrectomy). This seems to be the first instance reported in the literature in which the kidney with this implant in the human being could be studied histologically.

The kidney was smaller and firmer than normal and was densely adherent to the enclosing fascial and fatty capsules. The mucosal lining of the renal pelvic cavity was congested, tumid, thickened, and revealed several superficial ulcerative lesions. The initial portion of the ureter was thickened and its lumen was dilated.

Histologically, the kidney parenchyma was found to be the seat of a diffuse inflammatory process of intertubular character. There were lympholeucocytic aggregations, especially visible in the environs of the glomeruli of the cortical region of the kidney and about the vessels of the corticomedullary region. In one of the microscopic sections there were encountered residua of the implanted muscle tissue. These had the form of irregular islands of muscle elements in the process of reabsorption. Along one side of this area the muscle tissue was being penetrated by young connective tissue; along the other side, between the implant and the normal kidney the parenchyma was a broad band of inflammatory infiltration (lymphocytes and leucocytes); however, even here, connective tissue substitution for the muscle tissue was lively. The enveloping kidney parenchyma showed no evidence of involvement in this process of substitution; however in many places there were giant, multinucleated, foreign body cells which must have originated from the parenchyma of the kidney itself. Also the glomeruli directly involved in the zone of substitutive changes seemed to be in the process of dissolution.

Thus, it is seen that the findings were very much like those described in the reports of animal experimentation; however, in the animal the substitution process had proceeded to completion with complete disappearance of the muscle implant by the end of 2 months. In the human being the delay in completion of this substitution process is considered, by the author, not to reside in the inflammatory condition of the kidney parenchyma (such a process should rather accelerate the process of destruction of the muscular implant), but rather in the massiveness of the implant itself.

There was absolutely no evidence of any attempt at self regeneration of the muscle tissue itself nor was there any evidence of calcification, such as has been reported by some writers with reference to the findings in animal experimentation.

—*John W. Brennan, M.D.*

Experience with Partial Nephrectomy (Erfahrungen mit der partiellen Nephrektomie). ZOLTAN SZENDROI and ANTAL BABICS. *Urologia*, Treviso, 1955, 22: 1.

TWENTY CASES of partial nephrectomy are reported. Ten of these operations were done for renal stone and 8 for renal tuberculosis; 1 operation was done for renal tumor and 1 for renal cyst.

The operative technique employed by the authors consisted of ample exposure (generally with resection of the twelfth rib) and mobilization of the kidney. In order to improve visibility the kidney pedicle was temporarily compressed by means of forceps with rubber-armed branches; however, this compression was never applied longer than 22 minutes.

Preceding the operation, the patient was treated with streptomycin, and postoperatively with streptomycin combined with isonicid (INH) in the tuberculous patients, and with threomycin (chloramphenicol) in the nontuberculous infections.

If the calyx was opened in the wedge-shaped excision it was sutured in an everted position and parenchymal sutures were placed. Before these sutures were tied the compression was gradually loosened and any bleeding points were understitched and ligated. If the bleeding proved to be controlled the parenchymal sutures were tied and the remainder of the operative wound was closed with a row of U-shaped sutures. In 1 instance a muscle flap was inserted between the wound surfaces with good results. The incision in the kidney was covered with gauze soaked in a solution of streptomycin, a drain was introduced, and the wound was closed. The electric knife was not used.

The adequacy of the technique was perhaps reflected by the fact that in none of these patients did a urinary fistula develop.

On the basis of this experience with, of course, an extensive consultation of the literature, the authors conclude that in patients with well delimited lesions of the kidney, partial nephrectomy offers a safe and reliable approach to therapy in various forms of renal disease, particularly in instances of renal stone. In fact, it represents a method of treatment for these cases which is to be preferred to other conservative operative procedures.

In renal tuberculosis this operation proffers new possibilities in the localized, isolated forms. Although the time which has elapsed since the operation in the authors' material is still too brief to permit of ultimate evaluation, their experience thus far has been fully satisfactory. In the residual kidney the method permits a therapeutic approach in tuberculosis of a localized nature, a problem which has previously been considered hopeless.

Although partial nephrectomy represents a rather complicated procedure, the authors believe that, in properly selected cases, it presents no greater stress for the patient than does nephrectomy. They are certain that in the future, with improvement in diagnoses and surgical procedures, still better results will be obtained in the conservative surgical treatment of renal tuberculosis. —*John W. Brennan, M.D.*

Some Newer Aspects of Renal Vascularization; Preliminary Note (Quelques nouveaux aspects de la vascularisation rénale; note préliminaire). JOAO COSTA, ANTERO DE CARVALHO, and AIRES RANGEL. *J. urol. méd.*, Par., 1955, 61: 3.

FOR APPROXIMATELY 2 YEARS now, the authors have been working on a method for demonstrating the arterial supply to the glomerulus of the kidney. The

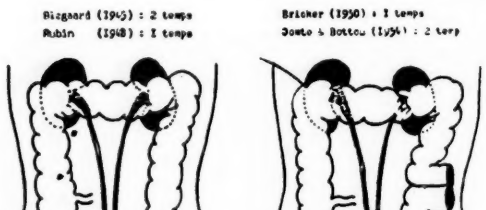


Fig. 1 (Gregoir, Van Wien).

work has been conducted exclusively on the kidney of the dog. A series of 14 microscopic photographic reproductions illustrate some of the results procured with the method (details of the method employed will be published later). Essentially the method consisted of the injection, using a plastic substance, of the arterial vascular system supplying the glomeruli, followed by traction on certain of the glomeruli it was desired to demonstrate.

Essentially, the matters which the authors wish to communicate in this report are the following: the authors have not observed evidence of the cul-de-sac ends of the terminal arterioles described by Trabucco and Marquez (*J. Urol.*, Balt., 1954, 72: 1061); the terminal arterioles seem to go over into capillaries which then reunite to form the collecting arterioles and efferent arteries as originally described by Bowman in 1842. They have found no evidence of the by-passing vascular arrangement as postulated by Goormaghtigh (*J. urol. méd.*, Par., 1951, 57: 569; INTERNAT. ABST. SURG., 1952, 95: 57).

The positive findings which the authors have made consist in the fact that the vascularization of the glomeruli appears to be more complex than has generally been assumed. There are a surprising multiplicity and complexity of interconnections of the afferent and efferent and of the so-called interglomerular anastomoses. The findings of Simoes de Carvalho are noted; that is, the fine vascular branches emitted by the interlobar arteries which course in various directions and without subdivisions, and terminate in a free point. The authors speculate as to the possible relationships existing between these tiny vessels, whose terminal connections are unknown, and those which they have encountered and which are derived from the glomerular vessels.

—*John W. Brennan, M.D.*

BLADDER, URETHRA, AND PENIS

Artificial Cecal Bladder (La vessie caecale de substitution). W. GREGOIR and VAN WIEN. *Acta urol. belg.*, 1955, 23: 72.

THE FUNCTION of the urinary bladder may be destroyed or damaged beyond repair by degenerative or malignant changes, and circumstances are created in which it becomes imperative to replace the organ or to provide a new urinary outflow.

The shortcomings of nephrostomy, pyelostomy, bilateral cutaneous ureterostomy, and ureterosimoidostomy are described and the results obtained with these procedures are compared with the results obtained with the use of an artificial cecal bladder. It is concluded that a cecal bladder is superior to a ureterosigmoidostomy because patients do not develop electrolyte imbalances and ascending pyelonephritis. The procedure carries less risk than a ureterosigmoidostomy in the presence of ureteral dilatation and infection. It is considered superior to an artificial ileal bladder because a urinal bag is not required. The disadvantage of difficult catheterization of cecal bladders may be decreased by the continuous use of an indwelling de Pezzer or Foley catheter and by reduction of the length of small bowel used.

A cecal bladder is indicated in the presence of the following conditions: (a) carcinoma of the bladder with extensive radium or x-ray destruction, in the presence of tumor recurrence, intolerable dysuria, or when a total cystectomy is indicated; (b) uterine cancer; (c) rectal carcinoma extending to the prostate and bladder; (d) advanced carcinoma of the prostate with involvement of the bladder; (e) some vesicovaginal and some rectovesicovaginal fistulas with radionecrosis; (f) vesical gangrene as a result of caustic or acid instillations, where destruction of the external sphincter has occurred.

The creation of a bladder with the use of an isolated segment of bowel is not associated with acidosis or infection, which occurs in 40 to 50 per cent of cases in which ureterosigmoidostomy is performed; furthermore it has been observed that patients with severe cases of these complications are relieved when the segment of bowel is isolated and intestinal continuity is interrupted.

The various procedures (described in the literature) which may be used to create an artificial bladder with an isolated segment of intestine are illustrated in Figure 1. They are divided into two groups: (1) operations in which the sphincter mechanism of the bladder is preserved, which procedures are infrequently applicable (Bizgaard, Rubin techniques); (2) operations in which the new bladder has a stoma opening directly in the skin (Verhoogen, Bricker, Gilchrist and Merricks).

The technique used by the present authors in the 5 cases reported is a variation of the technique of Gilchrist and Merricks.

The bladder is constructed with 20 cm. of the terminal ileum and right colon up to the midtransverse line; intestinal continuity is re-established preferably by an end-to-end anastomosis of the ileum and midtransverse colon; the pelvic ureters are dissected and anastomosed to the posterior wall of the cecum; the ileum is brought out to the right lower quadrant and a Foley or a de Pezzer catheter is introduced into the cecum.

The operation was well tolerated by all 5 patients, with early improvement of renal function. Continence of the cecal bladder was poor (half hour) and catheterization difficult. The proposed advantages of peristalsis and ileocecal valve to produce continence are believed to be more theoretic than real, and in the future a smaller segment of small bowel is to be used in the hope of making catheterization easier. The constant use of an indwelling catheter unclamped for evacuation every three hours has proved satisfactory. With use of the right half of the colon, a capacity of 300 to 400 c.c. is obtained.

Manometric studies of an incompletely filled bladder revealed changes of pressure of 10 cm. of water produced by spontaneous contraction of the newly formed organ. If the bladder was full, greater pressures were recorded in rest periods with variations of 80 cm. of water in the presence of spontaneous contractions. The transmission of these pressures to the kidney pelvis was demonstrated when simultaneous recordings were obtained through nephrostomy tubes and the indwelling catheters of the cecal bladder. For these reasons, the avoidance of overdistention with urine is advisable in order to prevent cecal-ureteral reflux. —*Néstor S. Martínez, M.D.*

Radium Treatment of Epithelial Tumors in the Bladder Through an Osteotomy Opening (Radiumterapia dei tumori epiteliali a vescica aperta). MARIO MORELLI GUALTIEROTTI. *Urologia*, Treviso, 1955, 22: 27.

THE TECHNIQUE of radium treatment of epithelial tumors of the bladder is essentially that of Darget. Through a suprapubic opening into the bladder the tumor is excised, or at least planed down level, and the radium needles are inserted in the usual manner. A Pesser catheter is inserted to drain away the urine and then the rest of the bladder cavity is sealed off with an inflated bag, the inflation being accomplished by filling the bag with a solution of lead nitrate. This last expedient serves both the purpose of holding the needles firmly in place and protecting the rest of the bladder mucosa from the radiations.

After the calculated period of exposure (usually about 5 days) the bag and needles are withdrawn; however the catheter is left in place while the healing is in progress. So far, the author's service has not experienced the least bit of trouble with the method.

In the period from October, 1952 to the end of 1954, 17 patients were treated by this technique, and enough time has now elapsed to permit evaluation of the treatment. For the purpose of evaluation this material has been divided into 3 groups. The first division consists of one case of simple, recurring papilloma; the second group consists of 2 cases of papilloma with conspicuous evidence of malignant degeneration; and the third group consists of 2 cases of cancer of the vesical cupula, 1 case of cancer of the ureteral apertures, 4 cases of cancer of the bladder neck, and 7 cases of extensive cancer located in several places.

In the patient comprising the first group complete success was obtained in the subject who had previously received innumerable treatments with endoscopic electrocoagulation. In the second group complete cure was procured in both patients.

In the 2 instances of cancer of the cupula in the third group, freedom from recurrence up to the present time was obtained in 1, a case of infiltrating carcinoma of the cupula; in the second patient of this group there has been a recurrence. In the single instance of papilliferous cancer of the ureteral aperture, death occurred 7 months later of metastasis to the liver. Among the 4 instances of cancer of the vesical neck there was 1 clinical cure, secondary calculosis developed in another metastases to the inguinal lymph nodes developed in the third and death occurred as a result of recurrence and cachexia in the fourth.

In the remaining 7 patients with extensive, multiple-located cancerous lesions, there was 1 instance of very widespread cancer, starting at the vesical neck and involving a large portion of the posterior wall; the condition was re-examined after 4 months, and a second application through the osteomized bladder was carried out. At this time the result from the first application of the radium was observed to be optimal. Eighteen months after the second application the control examination disclosed a perfect vesical integrity. This, however, was the only positive result in these patients as the other patients died of metastasis or recurrence at periods of from 4 months to a year.

Thus, the author concludes that optimal results may be expected in limited lesions without macroscopic infiltration of the bladder wall (limited to the mucosa), that encouraging results may be obtained in some conditions which have broken through the mucosal barrier, especially in that form which is implanted on the vesical neck, a form which seems to be more sensitive to irradiation than that located elsewhere in the organ, and, finally, that mediocre or decisively poor results may be expected in lesions profoundly infiltrating the muscle layers.

Darget claims a rate of cure of 42 per cent; the author, however, is rather skeptical of such an interpretation and this skepticism has resulted in his limiting the indications for this type of therapy. It is considered that the most that can be looked forward to is the application of the method to the obstinately recurring forms of papillomatosis which the author's experience has led him to consider as clinically malignant. The extensive or infiltrating lesions should be reserved for the various forms of radical treatment, and not treated according to the local condition present or the general stage of the patient.

—*John W. Brennan, M.D.*

A Case of Reticulosarcoma of the Urinary Bladder (Un caso di reticolo-sarcoma della vescica). MARIO FERNANDEZ. *Urologia*, Treviso, 1955, 22: 47.

THE PATIENT was a 60 year old married man who came to the clinic on the insistence of his wife. For about 2 years he had been noting traces of blood in

his urine, which appeared and disappeared alternately. Even the descending pyelogram suggested a filling defect in the right half of the bladder and pneumocystography disclosed a mass the size of a small apple with considerable evidence of superficial calcifying processes on the right lateroposterior wall of the bladder cavity. The cystoscope showed normal bladder findings with the exception of an irregular mass, of sessile character and covered with incrustations. The mass was situated in the right half of the organ near the cupula which bled easily on manipulation.

At operation the mass itself and a considerable collar of contiguous bladder wall were removed by fulguration. Under the customary regime for such interventions the convalescence was without incident and now, some months later, after a series of roentgen treatments, the patient is enjoying optimal health, the urine is limpid, and the cystoscopic examination is negative.

Macroscopic examination of the removed specimen showed on cut section how the tumor had infiltrated all layers of the wall of the bladder at the place of attachment. The cut surface was of a grayish red color and presented a meaty consistency.

Microscopic examination disclosed zones of connective tissue character and zones of neoplastic nature. The connective tissue areas exhibited precollagenic fibrillary tissue with a rich component of embryonic blood vessels and foci of leucocytic infiltration. The cells of the neoplastic areas tended to polymorphism, the cells being of varying size, some spindle-shaped, some bandlike, with a tendency toward a syncytial and reticular nature. There were also very large cells with multiple nuclei of a megakaryocytic character. There were numerous atypical mitoses. The diagnosis was vesical reticulosarcoma.

The microscopic findings are very similar to those given in the recent report by Camera which is the first report in the literature of a vesical reticulosarcoma, at least in the Italian literature. In this connection the author calls attention again to the reticular appearance of the neoplastic tissue and the almost complete lack of stroma, presenting thus an impression similar to the splenic tissue, an impression which has been described by Reitano as suggesting a tumor tissue composed entirely of cells lying free in the tumor parenchyma.

—John W. Brennan, M.D.

Fracture of the Penis (Sulle fratture del pene). G. CIRCELLA. *Urologia*, Treviso, 1955, 22: 59.

THE PATIENT awoke late for work and dressed in a hurry. The erected penis caught in a fold of clothing and hindered the fastening of the trousers. With a violent stroke of the hand he attempted to overcome the obstacle to dressing. At this precise time there was audible a crepitating sound in the corpus of the penis and the erection, without a bit of pain, immediately became flaccid. An egg-sized tumefaction quickly developed over the middle third of the penile body, the skin over the swelling assuming contemporaneously a bluish coloration.

On the advice of his brother, a medical student, the patient placed a tight rubber band around the base of the organ for the purpose of hemostasis; as a result the swelling and bluish color extended over the entire organ. At the emergency clinic the rubber band was removed and the patient sent to surgery for treatment. Here the organ, completely flaccid, showed a long diameter of 15 cm. and a greatest circumference (corresponding to the middle third) of 16 cm.; it was markedly cyanotic, the discoloration extending less densely onto the prepuce and for several centimeters upward from the base of the organ. There was pain to pressure over the middle third of the right corpus cavernosum, where there was perceptible a mild depression, while distal to this place the organ seemed to extend laterally.

The organ was immediately immobilized in a cardboard modelled trough, an ice bag was placed over it penicillin therapy was started, and hemostatics were administered parenterally. The following day the tumefaction and cyanosis had evidently increased and surgical intervention was decided upon.

At operation the hematoma was evacuated and the laceration in the tunica albuginea and corpus cavernosum, 3 cm. in length and about 2 cm. in depth, was closed with interrupted sutures of catgut No. 0000 and the skin was approximated with fine silk sutures. With this repair there was an evident correction of the penile deformity. A compressive dressing was applied and, to forestall infection of the locus from the urethra, a catheter was inserted and left in place for 5 days. Penicillin and hemostatics were administered as described for the period of medical therapy and possible erections of the organ were combated by intramuscular administration of estrogens and with bromide of camphor. The wound was healed without incident by the fifteenth postoperative day.

Thirty days later the patient stated that erections occurred with a perfectly normal penile axis (no deviation) and 6 months later he reported absolutely normal urinary and sexual functioning.

The author believes that with minor tumefaction in these instances, medical therapy, as outlined, may be sufficient; however, with the more important hematomas he does not believe that the surgeon is justified in permitting the blood clot to go on to cicatrization with consequent deformity of the penile axis, which perhaps would require a much more difficult intervention for its correction.

—John W. Brennan, M.D.

MISCELLANEOUS

Pelviovenography—a New Diagnostic Aid in Tumors of the Bladder (Pelveovenographie—ein neues diagnostisches Hilfsmittel bei Blasentumoren). E. ZEMAN. *Zschr. Urol.*, 1955, 48: 129.

THE RECURRENCE of cancer of the bladder after total cystectomy has unfavorably influenced the operative treatment of this disease. To some extent this is due to the improper selection of cases for this radical operation. To improve the selection of patients for radical cystectomy, the use of pelviovenography as an aid in the evaluation of operability is suggested. It is generally recognized that extension of the bladder cancer into the wall of the bladder itself is associated with a high postoperative recurrence rate. When the bladder is invaded by the cancer, the vesical venous plexus on

the affected side is apt to be blocked by the growth. The block of the veins of the vesical plexus can be demonstrated by pelviovenography.

The technique of pelviovenography is as follows: the bladder is filled with air or water beforehand and 10 c.c. of a 1 per cent novocain solution are injected into the corpora cavernosa. Through the same needle, 20 to 40 cc. of a 35 to 70 per cent contrast medium (used for intravenous urography) are injected fairly rapidly. The x-ray exposure is made during the injection and also 10 to 15 minutes later. The patient is instructed to hold his breath during the exposure.

According to the findings of pelviovenography, bladder tumors can be divided into four groups.

1. The tumors which do not invade the bladder wall. In these cases the venous plexus of the pelvis does not differ from the normal. These are the most favorable cases for total cystectomy.

2. The tumors which invade the bladder wall in a small or moderate way; these cases are borderline from the point of view of operability.

3. The tumors which invade the bladder wall and the venous plexus as well; these are considered inoperable.

4. The tumors on the anterior wall or on the dome of the bladder. In such cases infiltration of the growth into the bladder wall does not produce changes in the pelvic venous plexus.

Pelviovenography is considered an important adjunct in the selection of patients for radical cystectomy for cancer of the bladder.

—*S. Richard Muellner, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Diagnosis of Orthopedic Lesions by Aspiration Biopsy; Results of 1,061 Punctures. CARLOS E. OTTOLENGHI. *J. Bone Surg.*, 1955, 37-A: 443.

COLLABORATING with Jose Valls and Fritz Schajowicz, the author has written a book and a number of articles on the subject of "Aspiration Biopsy in Orthopedic Lesions." Reference is made to the work at Memorial Hospital in New York by clinicians, surgeons, and pathologists such as Martin, Ellis, Sharp, Stewart, Snyder, Coley, and others.

The diagnosis of orthopedic osteoarticular lesions is based upon three principal factors: (1) clinical examination; (2) roentgenographic examination; and (3) laboratory examination (pathological, bacteriological, chemical, and histochemical).

The advantages of aspiration are as follows:

1. The method is simple.
2. The patient is not submitted to any risk.
3. The aspirating needle may penetrate many points in the lesion.
4. Major surgical operation may be obviated.
5. Because of its simplicity patients accept aspiration biopsy sooner than they would a major surgical biopsy.
6. In the majority of cases the method can be applied to out patients, thus saving the patients both time and money.
7. When the technique has been mastered the procedure can be carried out by nonspecialists and in areas distant from the larger medical centers.
8. Aspiration biopsy offers no disadvantage to the patient who must later submit to an operation.
9. Aspiration biopsy does not interfere with roentgen therapy if this treatment is later found necessary.
10. Aspiration biopsy does not exclude open biopsy.

The disadvantages of aspiration biopsy are as follows:

1. The small amount of material withdrawn.
2. The aspiration biopsy is a blind method. This objection can be ruled out since the location is determined by x-ray.
3. The needle may damage some important organs. The authors state that in 1,061 punctures this has never occurred.
4. It is argued that the tissues to be examined may be structurally altered by aspiration biopsy. This has not occurred in the experience of the authors.
5. It has been pointed out that in many cases aspiration biopsy produces results which are inconclusive because based on insufficient evidence. It must be stated that anatomopathologic examination can be made both of smears and embedded material. Some writers who have reported on this method had made use of the cytologic method only. In that case it is quite probable that the results would be uncertain. Whenever possible a cytologic study of the material is effected on smear, but the authors reserve the greater portion for embedding in paraffin in order to carry out histologic studies of the lesion.
6. In none of the authors' cases has hemorrhage occurred, with the single exception of a case of generalized plasmacytoma in which a hematoma was produced in the needle tract of a vertebral puncture.
7. It has been argued that aspiration biopsy may provoke the development of neoplastic and infectious lesions, that is to say, local contamination. As has been stated, this has not occurred in the authors' series.
8. The co-operation of a competent anatomopathologist is required. This objection is valid, but the same might be said of any operation carried out by an inexperienced surgeon. The small quantity of the material obtained calls for a skill which not every pathologist can boast of. The pathologist should be a specialist in bone pathology.

The authors present to the pathologist not only the material obtained by aspiration biopsy, but also the clinical examination and the roentgenograms. They discuss the technical considerations and urge that aspiration biopsy be done before any treatment, particularly roentgenogram therapy, is begun.

In the 1,061 aspirations carried out upon 998 patients, the results were classified as positive, doubtful, and negative. The positive cases numbered 895, or 84.35 per cent; the doubtful cases 45, or 4.25 per cent; the negative cases, 122 or 11.40 per cent. In 49 cases repeat punctures were made, either because of insufficient material or to confirm a diagnosis, or because the lesions have several foci and punctures were made in several bones. Of the 49 repeat aspirations, 24 were positive, 7 were doubtful, and 18 were negative.

The authors list a summary of the positive diagnoses covering malignant and benign lesions, neoplastic and inflammatory, and including cases of infection and arthritis. —*Daniel H. Levinthal, M.D.*

Aspiration Biopsy in Bone Lesions; Cytologic and Histologic Techniques. FRITZ SCHAJOWICZ. *J. Bone Surg.*, 1955, 37-A: 465.

THE AUTHOR discusses his experience over a period of 15 years with aspiration biopsy of bone lesions and tumors of the soft tissues of the extremities. Both cytologic and histologic examinations are used by the author. Smears are made, but the more important parts of the aspirated fragments are imbedded in paraffin.

The aspirated material is expelled into a sterile test tube which contains a few centimeters of saline solution. At times it is necessary to punch out a plug of tissue from the needle with the obturator. When an inflammatory process is suspected part of the material is introduced into a second sterile test tube in order to perform the usual necessary bacteriologic investigation by means of smears and cultures, or, if tuberculosis is suspected, by guinea pig inoculation. The material is sent immediately to the pathologist. If there should be any delay it is placed in the refriger-

ator. The technique and staining of the material obtained is described in detail.

—*Daniel H. Levinthal, M.D.*

The Significance of Skeletal Lesions in Infants, Resembling Those of Traumatic Origin. PAUL V. WOOLLEY, JR., and WILLIAM A. EVANS, JR. *J. Am. M. Ass.*, 1955, 158: 539.

THE AUTHORS describe the skeletal lesions seen in infants which resemble those due to trauma, but for which no explanatory history of injury is obtained. They refer to chronic subdural hematoma with fractures of the long bones, and increased metaphysial fragility of infancy. The study covers an examination of material seen over an eight-year period, with roentgenographic findings suggestive of injury, with or without a history of trauma.

Four broad conclusions are drawn:

1. A history of injury in any clinical category of skeletal damage may be readily obtained, elicited only with difficulty, or not confirmed at all. There are no roentgenologic criteria for classifying cases on the basis of the presence or absence of a valid story of violence.

2. The general environmental factors surrounding infants who suffer osseous discontinuity range from "unavoidable" episodes in stable households (through what the authors have termed an unprotective environment) to a surprisingly large segment characterized by the presence of aggressive, immature, or emotionally ill adults.

3. There is little evidence, clinical or roentgenographic, to support belief in unusual fragility of bone as an entity during infancy, nor is there evidence of any peculiar association between subdural hematoma and increased skeletal fragility. Little evidence was found for confusion between the various recognized clinical states leading to a hypothetic increased tendency to fracture and the multiple skeletal defects that appear grossly to be due to some unrecognized trauma.

4. A study of 12 infants presenting multiple areas of bone damage, which appeared to have accrued over an extended period of time and for which no easily elicited story of injury was available, shows that they came invariably from unstable households with a high incidence of neurotic or frankly psychotic behavior on the part of at least one adult, and the authors termed such situations injury-prone environments. When these infants were removed from such surroundings and treated as if their defects were due to adverse stresses, healing took place promptly and new lesions did not develop.

The incidence of injury to tissues apart from the skeleton was much higher than would be expected fortuitously, and these injuries included four examples of intracranial bleeding as well as several contusions, lacerations, and hematomas of the scalp without evidence of deeper pathology.

It is difficult to avoid the over-all conclusion that the occurrence of skeletal lesions having the appearance of fractures—regardless of a history of injury or the presence or absence of intracranial bleeding—are due to undesirable vectors of force.

—*Daniel H. Levinthal, M.D.*

Nonosteogenic Fibroma of the Bone; a Review of the Literature with the Addition of 6 Cases. JAMES A. DEVLIN, HAROLD E. BOWMAN, and C. LESLIE MITCHELL. *J. Bone Surg.*, 1955, 37-A: 472.

DURING the past 3 years in the Henry Ford Hospital, Detroit, Michigan, 6 cases classified as nonosteogenic fibroma of bone (as described in the literature in 1942 by Jaffe and Lichtenstein) have been diagnosed. Previous to the time of the present report, the lesion has been described as a "giant cell variant of bone cyst or osteitis fibrosa," "healing variant of giant cell tumor," "xanthic variant of giant cell tumor," "solitary xanthoma or xanthogranuloma of bone," and as "fibrous osteomyelitis."

The clinical history and the roentgenographic and pathologic findings in the 6 cases presented in some detail by the author encourages the recognition of this lesion, nonosteogenic fibroma, as a distinct entity, especially in the cortical metaphyseal region. Complete curettage or subperiosteal resection of the affected area is supported as the method of treatment.

—*Daniel H. Levinthal, M.D.*

Osteoid Osteoma (L'Ostéome ostéoide). S. DE SÉZE, J. DEBEYRE, P. ORDONNEAU, A. DJIAN, and A. MAZABRAUD. *Sem. hôp. Paris*, 1955, 31: 157.

PRIOR to Bergstrand's and Milch's reports, in 1930 and 1934, osteoid osteoma was usually considered to be an infectious bone disease. Jaffe, in 1935, was the first to classify it among the benign tumors of bone. The 6 cases reported by the authors confirm several previously established facts, i.e., the lesion is usually located in the long bones (in 3 of the 6 cases reported the lesions were on the femur, in 1 case on the posterior aspect of a cervical vertebra, in 1 case on the spine of the scapula, and in 1 case on the tibia). It is encountered most frequently in children and young adults. In this series, 1 of the patients was 8 years of age, 2 were 17 years of age, 2 were between 20 and 23, and only 1 was 42 years of age. Osteoid osteoma is predominant in males, and this was the case in 4 of the 6 cases.

In most instances, the pain is experienced at the actual site of the lesion, although osteomas located near a joint can cause radiating pain and articular symptoms which can be misleading to the clinician. The pain is characterized by nocturnal exacerbations.

The typical roentgenologic picture of the lesion is that of a small, round area of clarity surrounded by a circular zone of osteoconcentration. This picture, however, is not constant; when an osteoid osteoma develops in cancellous bone, it appears as a larger rounded lesion, surrounded by little or no sclerosis. Lesions developing in hard bone are surrounded by a spindle-shaped area of sclerosis; others, finally, developing in cortical bone may cause hypertrophic osteoperiostitis. In the middle of this intense sclerotic reaction, the actual nodule of the lesion although present, may become invisible. Bone tissue may also invade the osteoid tissue forming the nodule, thus obscuring the clear image at the center of the lesion, which may disappear. This invasion by bone tissue has been interpreted at times as a sign of spontaneous healing; thus far, however, there has been no means of confirming it.

Atypical roetgenologic pictures may be very difficult to interpret. In these cases only a biopsy will differentiate osteoid osteoma from other lesions such as eosinophilic granuloma, chronic condensating osteomyelitis, or central abscess of the bone.

A simple operative procedure completely enucleating the lesion provides relief of the pain, and cures the patient. It is important that the lesion be removed *in toto* in order to allow satisfactory histologic study; microscopic study of fragments removed with a curette is often confusing.

There is still considerable controversy as to whether osteoid osteoma is tumoral or inflammatory in origin. The high incidence of trauma preceding the development of the lesion seems worthy of mention with regard to possible subsequent medicolegal actions.

—*Fernand R. Schmidt, M.D.*

Contribution to the Etiology of Epicondylitis Humeri and Other Injuries of the Arm Due to Overexertion (Ein Beitrag zur Genese der Epicondylitis humeri und anderer Uberlastungsschaeden der Arme). J. Mordeja. *Zschr. Orthop.*, 1955, 86: 58.

External humeral epicondylitis is caused principally by a periosteal irritation of the external epicondyle which serves as the common origin of the extensor muscles of the forearm. Many patients with this condition also show a dystonia of the sympathetic nervous system. The possibility of a relationship between lateral humeral epicondylitis and acroparesthesia is considered; occasionally epicondylitis disappears after elimination of the focus of infection. A deficiency of Vitamin D as part of a state of malnutrition may cause lateral humeral epicondylitis without definite trauma, and a lack of hormones also is considered as an etiologic factor. This belief is based on the fact that the condition was found mostly in people 50 years of age or older.

Corradini found degenerative changes (originating in the external epicondyle) in the tendons and muscles of very young individuals suffering from lateral epicondylitis. The angle of the elbow was measured in 534 individuals (256 males and 278 females). Among these, 63 males and 88 females showed signs of lateral humeral epicondylitis. Most of the patients affected with this condition showed a cubital angle of between 165 and 175 degrees. The majority of males were 20 years of age or younger; the majority of females were between the ages of 41 and 65 years. It was found that individuals having a large cubital angle were more likely to suffer from tennis elbow, due to increased strain of the muscles which take their origin at the level of the lateral humeral epicondyle.

—*George I. Reiss, M.D.*

Calcification of the Posterior Cruciate Ligament of the Knee Associated with Osteochondritis Dissecans of the External Condyle of the Femur (Calcificazione del legamento crociato posteriore del ginocchio associata con osteocondrite dissecante del condilo esterno del femore). Giorgio Fonda. *Ann. ital. chir.*, 1955, 32: 268.

The patient was a 22-year-old housewife who came to the clinic complaining of intermittent periods of pain in the left knee. She had experienced a succession of accidental injuries. At 10 years of age she suffered a fracture of the right external malleolus, which seemed to have healed correctly and without sequelae; a year previously she had suffered a fracture of the right patella which had been treated by immobilization in a plaster cast; six months later she suffered a distortion of the left knee. Under medical measures the tumefaction and stiffness regressed, as did the pain, but, this last symptom would reappear at intervals, particularly with changes in the weather.

Roentgenologic examination disclosed two abnormal conditions in the region of the left knee. First there was the odd shadow, or shadows, clearly defining the course of the posterior cruciate ligament, i.e., from the intercondyloid spine posteriorly to the medial condyle of the femur anteriorly. This shadow was of equal width from one end to the other and seemed separated into two lateral denser bands traversed centrally by a less dense strip. The author recalls the statement of Ferrarini and of Machol, that the roentgenographic shadow of heterotopic processes of calcification tend to present a density which becomes progressively more pronounced from the periphery to the center.

The second abnormal finding was an irregularity of contour of the lateral condyle of the femur of the same side. The image reproduced suggested an osteochondritis dissecans. The region of the lateral condyle involved by the osteochondritic process was posterior, towards the point of attachment of the calcified posterior cruciate ligament.

In searching for a possible relationship between these two abnormal findings, the author observes that the calcemia (method of Jendrassik) was 11 per cent, or at about the upper limit of normal. The patient also showed a quite pronounced genu valgum. He suggests that the deformity of the knee was a source of irritation, perhaps of actual rupture of some of the fibers of the posterior cruciate ligament, and that some interference with the normally meager blood supply of the ligament led to aseptic necrosis with replacement of the necrotic tissue by calcium.

A further hormonal factor might be assumed from the facts that (1) the patient had been troubled from the period of puberty by menstrual irregularity, and (2) she had never become pregnant. In this connection the author recalls that good results have been reported in the treatment of osteochondritis dissecans of the spine by means of estrogens.

—*John W. Brennan, M.D.*

Congenital Abnormalities of the Feet. Lawrence A. Davis and William S. Hatt. *Radiology*, 1955, 64: 818.

The authors attempt to formulate the radiologic aspects of the more common abnormalities of the feet from the standpoints of terminology and technique. The congenital abnormalities of the feet which were considered are: clubfoot (talipes equinovarus), "rocker deformity" (overcorrected clubfoot), flatfoot, metatarsus varus, and pes cavus.

Excellent radiologic illustrations depict the various congenital abnormalities of the feet.

Clubfoot (talipes equinovarus) is said to occur once in 1,000 births. In 57 per cent of the cases it is unilateral. The deformity consists of three component

parts: (a) adduction deformity of the forefoot; (b) inversion deformity, occurring mainly in the subtalar joint; (c) equinus deformity. Both forefoot and ankle equinus contribute to this latter deformity.

In the correction of the equinus of a clubfoot, the longitudinal arch in the midtalar joint is apt to "break" causing the characteristic "rocker deformity."

A short discussion of the other deformities is given.

—*C. Fred Goeringer, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Surgical Treatment of Rheumatic Tenosynovitis. Lot D. Howard, Jr. *Am. J. Surg.*, 1955, 89: 1163.

The author calls attention to nonspecific tenosynovitis because of existing confusion as to etiology and its relationship to industrial injury.

When the exact cause of the tendon sheath inflammation is not evident even after bacteriologic and pathologic study, the term "nonspecific tenosynovitis" is generally used. Cases in this classification are chronic in nature and resistant to the usual forms of conservative therapy. Remissions and exacerbations are common, and are aggravated by work. The author believes that this type of tenosynovitis is the result of a rheumatic disorder and therefore a manifestation of systemic disease. A rather extensive review of the literature is given.

The study is based on 11 cases (from a group of cases of so-called nonspecific tenosynovitis) selected as representative on the basis of similarity of complaints, physical findings, and conditions observed at operation. Of the 11 patients, 5 were women and 6 were men. In 3 of the patients the disease was bilateral. In all cases there was complaint of swelling at the time of first examination. Other symptoms, in order of frequency, were pain, limited motion, crepitus, and weakness. Eight of the 11 patients had a history of previous rheumatic joint disease or tenosynovitis of a similar nature. In only 2 cases was there a previous history of tuberculosis.

The diagnosis is based primarily on the history and presence of a boggy swelling involving one or more tendon sheaths. Crepitation may also be palpated if granulation tissue or rice bodies are abundant. There are no signs of acute inflammation, either local or systemic. Ganglion or tumor of the tendon sheath, or a tuberculous tenosynovitis must be ruled out.

In this series the author meticulously excised the tendon sheath involved. Two patients, after operative treatment of one side, received hydrocortisone (compound F) as an injection into the involved tendon sheaths on the other side. In both instances the swelling and symptoms were abolished within 24 to 48 hours, but recurrences followed and both patients were operated upon shortly thereafter. The author states that with this method of removal of the involved sheath but with preservation of the tendons, rheumatic tenosynovitis can be controlled. He states that after such a procedure full motion often does not result, but there is usually enough motion to be useful. In severe cases the tendon itself may be partially destroyed and may even rupture. In such cases it is necessary to reconstruct the tendon at the time the tendon sheath is removed. Hydrocortisone is instilled in the wound at the time of operation and reduces the pain considerably. —*Daniel H. Levinthal, M.D.*

Articular Replacement for the Humeral Head. Charles S. Neer, II. *J. Bone Surg.*, 1955, 37-A: 215.

Stimulated by his earlier studies of severe unimpacted fracture dislocations at the shoulder joint, in which the methods of excision, reduction, and arthrodesis had given unsatisfactory results, the author has designed a replacement prosthesis for the humeral head. The important features of his appliance are as follows: (1) it replaces only the articular portion of the humeral head, the bony tuberosities being preserved; (2) fixation to the humerus is by an intramedullary element which is flanged in the neck region to eliminate rotation; (3) there is a hole in the neck to which the tuberosity fragments are anchored to themselves and to the prosthesis in a fresh fracture dislocation; (4) three different stem sizes are available to permit accurate fit of the prosthesis; and (5) the appliance is made of vitallium.

The author prefers to approach the shoulder through the deltopectoral route, reflecting the anterior deltoid laterally, sufficiently to see the upper humerus. The subscapularis tendon is divided but this is not necessary in a fresh case with fracture of the tuberosity. Rather liberal capsular incision and excision are done to permit the head to be dislocated; its articular dome is removed with a broad osteotome. An opening is then made into the intramedullary cavity through the cancellous neck bone, and it is enlarged to permit introduction of the prosthesis. The author emphasizes that the articular surface must be in 20 degrees of retroversion in order to duplicate the normal.

In recent fracture dislocations, the head fragment is excised and the two tuberosity fragments are brought together, the lesser tuberosity from its medially displaced position and the greater tuberosity from the posterior position. They are anchored together and to the prosthesis by a wire-loop suture which passes through the hole in the neck of the prosthesis.

Postoperatively, sling and swathe protection is used. Pendulum exercises begin on the second day and further active shoulder exercises are added as the patient can tolerate them, but external rotation and abduction exercises are avoided during the first 3 weeks.

The author presents 5 cases of old injuries and 7 cases of recent fracture dislocations in which treatment by this method was carried out. There were no significant complications. The patients have experienced little pain. Range of motion, in general, has been good.

—*Charles T. Ryder, M.D.*

Clinicostatistical Contribution to the Subject of Transplantation of the Antagonistic Muscles at the Wrist in the Treatment of Radial Nerve Paralysis (Contributo clinico-statistico sul trapianto dei muscoli antagonisti al polso nella cura delle paralisi di radiale). S. Domeniconi and L. Trabucchi. *Chir. org. movim.*, 1955, 41: 41.

At the Rissoli Institute, Bologna, Italy, from 1936 to 1952, 73 patients with persistent radial palsy were subjected to operation. Of these 73 patients, 39 were suffering from traumatic paralysis of the radial nerve,

23 from spastic palsy, 6 from postpoliomyelitic paralysis; 4 had obstetric palsy, and the remaining patient had suffered traumatic destruction of the third, fourth, and fifth tendon rami of the extensor digitorum communis.

Fifty-three of these patients were operated upon by anastomosing the tendon of the flexor carpi ulnaris to the tendons of the extensor digitorum communis and by transplanting the tendon of the flexor carpi radialis to the tendons of the abductor pollicis longus and the extensor pollicis longus. These cases comprised the majority of the cases here reported, and it is in their management that the authors believe they have contributed most to the statistical status of the problem. The actual technique of the anastomosis was, in general, that recommended by Scuderi (Surg, Gyn. Obst., 1949, 88: 643).

The late results were classified chiefly on the basis of the degree of flexion and extension obtained at the wrist joint. Results were classed as good when the range of active flexion and extension at the wrist joint was 50 per cent or more (30 degrees of extension and 20 degrees of flexion); as fair when the final amplitude of wrist joint motion was 30 degrees (20 degrees of extension and 10 degrees of flexion); and as poor when the amplitude was less than 30 degrees, with perhaps an added ulnar deviation of the wrist joint.

On the basis of the criteria presented, the ultimate results in these traumatic cases are given as good in 23 (58.9%), as fair in 8 (20.5%), as poor in 6 (15.9%), and as unknown in 2 (4.6%).

In the 23 instances of spastic paralyses, good results were obtained in 12 (52%), fair results in 2 (9%), poor results in 8 (34%), and results unknown in 1 (5%).

Among the 6 cases of postpoliomyelitic paralysis, the results were good in 2, fair in 1, and poor in 3. In the one instance of tendon destruction (operation with a transplant from the tendon bank), the ultimate result was good (Fig. 22 in original text). In the 4 cases of obstetric paralyses, the results were good in 1 case, fair in 2 cases, and poor in 1 case.

Collateral interventions consisted of such procedures as shortening of the extensor radialis (12 cases), neurorrhaphy—without detectable results after 6 months (6 cases), capsulotomy of Delitala (4 cases), arthrodesis of the wrist joint (4 cases).

From the medicolegal standpoint the authors believe that the operative interventions described are instrumental in reducing the compensation allotted these patients by about 60 per cent.

Perhaps the impression obtained from this material is that the operative indications are rather rigidly standardized; however, the authors do not wish it to be so interpreted. They believe that the operative indications should be adapted to the individual patient after careful clinical and electrodiagnostic study.

—*John W. Brennan, M.D.*

Evaluation of the Results of Digital Flexor Tendon Grafts. Joseph H. Boyes. *Am. J. Surg.*, 1955, 89: 1116.

The results of flexion tendon grafting in the digits are best when the tissues are least damaged, when a full-length graft is used, and when an exacting technique is followed. Under these conditions it has been shown that 25 per cent of all cases will result in flexion of the pulp of the finger to reach the distal creases of the palm; in 50 per cent flexion will occur to within 1.4 inches and all will flex to within three-quarters of an inch of the distal crease of the palm.

The operative technique used throughout was basically the same, i.e., a full-length graft in the digit extending from the origin of the lumbrical muscle in the palm to the terminal phalanx. Bunnell's method of suturing was used throughout, and in all cases a new insertion was made directly into the bone of the distal phalanx. Pulleys were reconstructed where necessary, and by free graft if required, and in the last few years a separate nonabsorbable suture was used to approximate the deep digital fascia at the midjoint level, which here constitutes a minor pulley mechanism.

The palmaris longus tendon, when present, is almost ideal for a graft. It is usually of adequate length, small in caliber, and even when slipped out through two small incisions in the forearm has a thin, filmy layer closely adherent to the tendon.

All measurements of function were recorded as the distance in inches by which the pulp of the finger failed to touch the distal crease of the palm, as well as the angular motion in each joint. In the thumb, the arc of voluntary flexion was recorded as the numerator of a fraction, the denominator being the range of passive flexion. Conversion of this fraction into percentage thus gave a single figure. Results of a chosen group were then plotted on a chart which is cumulative in type. The results are outlined on graphs and charts.

—*C. Fred Goeringer, M.D.*

The Surgical Treatment of Progressive Idiopathic and Congenital Kyphoscoliosis by Arrest of Growth with the Aid of Staples on the Convex Side of the Vertebral Column and Fusion of the Spinal Processes. W. Mol. *Arch. chir. Neerl.*, 1955, 7: 65.

It was noted that immature vertebrae become wedge-shaped because of the arrest of the growth on the concave side. Kyphoscoliosis is a combination of kyphosis and the lateral anomaly. Many different causes are presented for kyphoscoliosis. It is believed that any attempt at surgical arrest of the vertebral growth should include at least one-half or a whole vertebra. Heavy antimagnetic rustless steel staples with legs about 2.5 cm. long are used. With this procedure the low concave half of the vertebra continues to grow. It was found that when stapling alone is done progressive kyphosis followed and at the same time the laminae and spinous process showed normal or increased growth. Stapling was used in 12 patients suffering from progressive idiopathic or congenital scoliosis. Paralytic forms of scoliosis are unsuitable for treatment by this method. The operation attempts to help the lateral and anteroposterior components of the curve. It is aimed primarily at the eighth, ninth, and tenth ribs. The periosteum is removed from the ribs and the ribs are resected over a distance of about 10 cm. Holes are pierced in a few vertebrae above and below an intervertebral disc so that an entire vertebra may be bridged. A 3 to 5 cm. long staple with 2.5 cm. legs is inserted. Three to five spinous processes at the peak of the kyphosis are resected and the

laminae are destroyed by deep cauterization. The defect is filled with bone chips or severed ribs. Special treatment is continued for at least 6 months. Six case reports are presented.

—*Richard J. Bennett, Jr., M.D.*

The Surgical Treatment of Spondylolisthesis Without Spine Fusion; Excision of the Loose Lamina with Decompression of the Nerve Roots. GERALD G. GILL, JOHN G. MANNING, and HUGH L. WHITE. *J. Bone Surg.*, 1955, 37-A: 493.

THE PREVALENT concept of the cause of symptoms in spondylolisthesis is based upon the belief that, because of the defect in the pars interarticularis of the fifth lumbar vertebra, there is instability at the lumbosacral junction and thereby a tendency to progressive forward-slipping of the vertebral body.

Progressive displacement may occur in children or, rarely, in adults as the result of severe injury, with immediate displacement from fracture through the transverse processes and articulations, with tearing of the annulus. If the symptoms were due to displacement alone, pain would be most marked during early childhood. This, however, is not the case.

Careful neurologic examination in the majority of these patients has revealed involvement of the fifth lumbar root, either unilateral or bilateral. In about half of the cases there has been involvement of the first sacral root. In spondylolisthesis of the fourth lumbar or the fifth lumbar vertebra, the fourth or fifth roots are involved, as would be expected.

Analysis has been made of all patients treated by decompression and followed for at least one year. These have been divided into two groups: (1) those treated initially by excision of the loose arch and decompression alone, and (2) those patients who had had previous unsuccessful attempts at fusion and were treated by decompression consisting in excision of the entire fusion mass and excision of the inferior articular process.

If the loose lamina is not very mobile, there may be no irritation of the dura. If the defect in the pars interarticularis is more posteriorly situated, pressure on the fifth lumbar root could not develop. Conversely, if the defect were anterior, then likelihood of compression of this root would be greater. This pathologic picture also explains why patients go for years without symptoms, since considerable time may be necessary for growth of a fibrocartilaginous mass large enough to compress and irritate the fifth lumbar root. It would explain, moreover, the sudden development of symptoms following a flexion injury, since the fibrocartilaginous mass would pull upon the adhesions between it and the nerve roots. Of even more importance is the explanation of the susceptibility of these patients to hyperextension injury. The jamming down of the loose lamina causes local irritation of the dura, stretching of the first sacral roots, and more downward pressure upon the fifth lumbar roots which are already in a precarious situation.

Coccygeal pain may be explained as the result of adhesions between the ligamentous flavum, the inferior edge of the loose lamina, and the dura. Tugging or pulling on these adhesions may give rise to pain in the lumbosacral area and, in many instances, to coccygodynia. That coccygeal pain may result from adhesions about the lower dural sac cannot be doubted. These symptoms may be relieved by division of the adhesions to the dural sac.

No support is used at any time during the postoperative period. For the first two or three days the patient experiences a moderate amount of pain in the back. He is encouraged to lie in any position and to move about; he may sit up as soon as he is able to do so. On the third day, he is ambulatory and straight-leg-raising exercises are begun, the patient lifting each low limb four or five times hourly. If by the fifth day straight-leg-raising is restricted to less than 75 degrees, an epidural injection through the caudal foramen is carried out.

If straight-leg-raising does not continue to be free—that is, if the limb does not reach at least 90 degrees—the epidural injection may be repeated at two-week intervals.

A completely free range of straight-leg-raising is most important; this prevents or minimizes the formation of root adhesions, the most common complication following surgery in this area. There is a definite complex which is evidenced by (1) attacks of catching pain in the back or in the buttocks, (2) limitation of straight-leg-raising on the affected side, (3) spasm on forward flexion with deviation to the involved side, in order to avoid stretching of the affected sciatic root, and (4) a list to the painful side on standing. When this symptom complex is present, rest or immobilization only makes the condition worse.

—*C. Fred Goeringer, M.D.*

Further Experience with Extra-Articular Arthrodesis of the Subtalar Joint. DAVID S. GRICE. *J. Bone Surg.*, 1955, 37-A: 246.

THE AUTHOR previously described his method for correcting paralytic flat feet by inserting two bone grafts into the tarsal sinus, which maintains the calcaneus in its anatomical position beneath the talus. He reviews the results of this procedure in 52 patients, and analyzes the complications which appeared in 11 patients, the other 41 having attained a good result in the sense that the foot showed good function and a satisfactory cosmetic appearance.

Loss of correction occurred in 2 patients because of improper placement of the grafts. Residual eversion of the heel and abduction of the forefoot resulted from inadequate replacement of the calcaneus medially in 2 cases.

Three patients in whom there had been a marked talipes equinus preoperatively showed recurrent deformity. To avoid this, wedging plasters may be used at 4 to 6 weeks postoperatively in cases of moderate equinus, while in severe equinus, calcaneal tendon lengthening and posterior capsulotomy may be considered.

In 4 patients, overcorrection produced a varus deformity which required re-operation in 2 cases.

When possible, tendon transplantation should be carried out at the time of the extra-articular arthrodesis of the talocalcaneal joint. The author recommends transplantation of the peroneus longus or brevis beneath the neck of the talus, and forward beneath the spring ligaments into the navicular for those patients

with complete paralysis of the anterior and posterior tibialis, along with severe valgus deformity. This procedure provides medial support. If the patient needs dorsiflexion power more than medial support, peroneus transplantation into the second metatarsal base is advocated. —*Charles T. Ryder, M.D.*

FRACTURES AND DISLOCATIONS

The Treatment of Supracondyloid Fractures of the Elbow (Degli esiti del trattamento delle fratture sovracondiloidee di gomito). GIUSEPPE SEGHINI. *Arch. chir. ortop. med.*, 1955, 20: 33.

IN A TOTAL MATERIAL of 223 treated fractures of the elbow, 48 were of the supracondylar type.

Of the three methods of treatment generally used in this type of fracture, i.e., (1) preliminary skeletal traction, (2) immediate reduction under roentgen control, and (3) immediate open operative exposure and reduction, the one most generally employed is the second method (favored by Boppe, Marino Zuco, Zanoli, Watson Jones, Boehler, Delitala, Merle D'Aubigné, Agrifoglio, Calvetti, and others). In the author's opinion this method should be employed in cases in which there is very little dislocation of fragments, in cases of fracture without hematoma or conspicuous hemorrhagic effusions, in cases in which there is no neurovascular involvement and, particularly, in cases coming to treatment within a few hours of the time of injury.

The author employs manual traction and hyperextension for reduction of the dislocation, as in the classic procedure; but instead of then flexing the elbow immediately to a right angle, the joint is maintained in the overextended position and the cast is applied with the arm in this position. The forearm is maintained in pronation if the distal fragment is externally rotated, and in supination if the reverse condition is present. This method of treatment seems to guard better against complications, particularly Volkmann's contracture, perhaps by leaving more room anteriorly for the expansion of any hematoma which might develop. Six patients were treated by this modified method in extension as practiced by the author, and the results are tabulated in the original text. All results (anatomic, functional, esthetic) were either optimum or good; there were no complications. In the lower bracket of this same table are shown the results of treatment by traction and hyperextension, followed by immediate flexion of the elbow to a right angle, and immobilization in this position.

In 18 cases the break was of the extension type (proximal fragment over-riding the distal fragment in front) and in 5 cases it was of the flexion type (distal fragment dislocated forwards, in front of the proximal fragment). Here the results were not so good; there was threatened ischemia in 2 cases, Volkmann's contracture in 1 case (owing to neglect on the part of the parents) varus deformity at the elbow joint in 3 cases, and valgus deformity in 1 case.

Preliminary skeletal traction, which method is favored by Putti, Carli, Baumann, Zeno, Lagomarsino, Scherer, and others, was resorted to in only 5 cases—2 infants and 3 adults. In the adults the fractures were multiple and exposed or compounded. Results, on the whole, with this method were not good, but the cases in this group were too few to admit of generalizations.

In 14 cases the fractures were complicated by the interposition of muscle and/or fascial tissues and were considered to be irreducible. Operation was performed. The treatment of these fractures has been much affected by the advent of the antibiotics. The author is of the opinion that at the present time these compound supracondylar fractures should be reduced with as little operative recourse as possible, and that operation should be done only in those cases in which reduction is otherwise impossible. A drainage tube should always be led down into direct contact with the fracture focus, and early and continuous general and local antibiotic therapy should be instituted.

There was only one instance of posttraumatic ossification of the tissues about the joint. The author believes that in those instances in which manipulations have been long-continued and arduous, the possibility of prophylactic treatment with roentgen therapy should be considered.

In the present series nerve injuries consisted of 1 case of median, and 2 cases of radial paresis. With good reduction and subsequent electrotherapy these conditions cleared up in 20 to 25 days; however, the author states he does not wish to be considered as making light of this formidable complication.

Resumption of articular function should be gradual and should be accompanied by a generous use of thermotherapy. —*John W. Brennan, M.D.*

Experience with the Double Nailing of Medial Fractures of the Neck of the Femur (Erfahrungen uber Doppelbolzung der medialen Schenkelhalsfrakturen). GEORG OSTAPOWICZ. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1954, 280: 154.

FRIEDRICH PAUWELS stated that union of fracture of the neck of the femur is possible only if the plane of the fracture line forms a 30 degree angle with the horizontal plane. He asserts that even malpositioned heads heal if the compression forces between the head and neck are satisfactory. Successful nailing of a fracture must (1) create satisfactory compression forces at the fracture site; (2) eliminate shearing forces; (3) accomplish accurate apposition of the fracture fragments. K. H. BAUER used a double nailing to accomplish these objectives: There are three types of double nailing:

1. In cases of delayed union, the insertion of a Johansson nail into the head up to the level of the chondral plate of the head.

2. In cases of simple pseudarthrosis, one nail is driven through the neck into the acetabulum.

3. In difficult forms of pseudarthrosis, 2 nails are driven through the head into the acetabulum.

The author reports the results of 136 cases of medial fractures of the neck of the femur. There were 117 fresh fractures and 19 patients were admitted because of pseudarthrosis.

As soon as the patient is admitted to the hospital, the affected leg is placed in a Volkmann splint. Under lumbar anesthesia the hip is nailed. Postoperatively the leg is immobilized in a Volkmann splint for an additional 4 weeks. In the fifth week the patient is allowed to do active and passive exercises while in bed; later on he is allowed up on crutches, and massage is used.

The total time of treatment in the present series averaged 2.7 months. Treatment by nailing was performed in 88 of the 117 patients with fresh fractures of the neck of the femur. Of 29 patients who were treated without nailing of the hip, 7 died. Forty-three patients who had been operated upon during the period between 1946 and 1951 presented themselves for re-examination in 1953; 4 patients revealed a shortening of the extremity of 3 cm.; 1 patient had a pseudarthrosis; 4 patients had necrosis of the head of the femur; 12 patients had some limitation of motion and limp, with shortening of the limb of about 2 cm.; and 19 patients were unable to ambulate without the help of a cane.

There were 10 patients with pesudarthrosis between 1946 and 1951 and 7 were treated with double nailing. Of the patients operated upon with double nailing, one died of circulatory collapse 2 days after surgery; 3 patients obtained very good results, and 4 had good function of the leg. One case revealed complete necrosis of the neck of the femur.

Reproductions of x-ray films of preoperative and postoperative conditions are presented. Double nailing of pseudarthrosis of the neck of the femur revealed good results in roughly 80 per cent of the cases.

—*George I. Reiss, M.D.*

A Report on 74 Cases of Pseudarthrosis of the Tibia Treated in the Years Between 1949 and 1953; Treatment and Results (Bericht ueber 74 in den Jahren 1949–1953 behandelte Tibia-Pseudarthrosen; Behandlung und Ergebniss). H. GEORG. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 178.

NEW BONE FORMATION in fractures appears to be a very complicated biological process, and this holds true also in cases of disturbed healing of fractures. In spite of a great deal of effort to explain and prevent the occurrence of pseudarthrosis of the tibia, reports have reached the author that the number of cases of tibial pseudarthrosis have increased in the last few years. In the past, the treatment of pseudarthrosis consisted of extensive resection with freshening up of the fragments and opening of the medullary cavity, the principle being to convert the pseudarthrosis into the fresh fracture. The fracture then was immobilized either by intramedullary nailing or by some other type of internal fixation. Phemister, however, used small bone grafts which he applied close to and around the area of pseudarthrosis.

Seventy-four patients were treated within 5 years. About half of the cases of pseudarthrosis were the sequela of a complicated type of fracture. In two-thirds of the cases the pseudarthrosis was located at the junction between the middle and distal third. Fifty-one patients were treated with bone grafts and 23 with resection of the fibula. In the majority of cases in which the fibula was resected, union occurred, and only in 2 cases was bone grafting necessary after resection of a portion of the fibula.

The indications for resection of the fibula were: (1) the absence of a dislocation; (2) The absence of angulation and severe misalignment; and (3) early development of pseudarthrosis and distraction of the bone fragments being the main cause for the development of pseudarthrosis. In those cases in which the pseudarthrosis developed later (from the twenty-fifth to the thirtieth week) resection of the fibula alone will not be sufficient, and the apposition of new bone close to the pseudarthrosis is necessary. The bone grafts were placed in an area away from the site of infection and alongside the area of pseudarthrosis without disturbing the pseudarthrosis itself. The bone grafts were fixed by means of a circular wire fixation. In most cases union occurred at the end of 105 days.

—*George I. Reiss, M.D.*

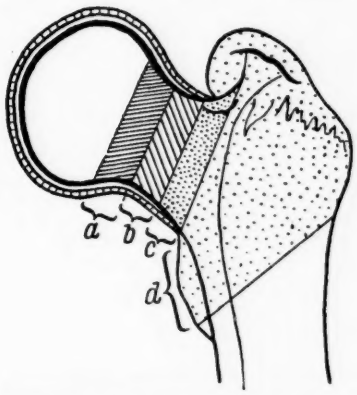


FIG. 1 (Georg Ostapowicz). Classification of fractures of the neck of the femur. *a* and *b*, medial; *c*, lateral; *d*, trochanteric fractures.

Contribution to the Nature and Treatment of Juvenile Slipped Head of the Femur. Report of 2 Cases of Hip Ankylosis Following Extra-Articular Nailing of the Neck of the Femur (Beitrag zum Wesen und zur Behandlung des jugendlichen Hueftkopfabrutsches; Mitteilung ueber 2 Hueftsteisen nach extraartikulaerer Schenkelhalsnagelung). H. HAFERLAND. *Chirurg*, 1955, 26: 257.

NUMEROUS FORMS of treatment have been suggested in the past 20 years for both malum coxae juvenilis (Perthes' disease) and coxa vara adolescentium (epiphysiolysis juvenilis). Throughout the course of this period, more aggressive treatments have been devised in order to avoid the unusually long delays rendered necessary by conservative management of these conditions, as well as the frequent complications of the latter, namely, osteoarthritic changes, recurrence of slipping of the femoral head, and impaired function of the hip joint. Nailing with a Smith-Petersen nail has been advocated by many authors. Others favor sudden reduction, believing that this procedure allows consolidation without residual stiffness of the joint or aseptic necrosis of the femoral head.

On the other hand, the effect of nailing or pinning does not rest upon a dubious mechanical fixation or an osteosynthesis of the neck and the slipped head of the femur. It is considered to constitute a strong biologic stimulant to new bone formation in the area of epiphysial necrosis.

According to the author, malum coxae puerilis (Perthes' disease) and coxa vara adolescentium (epiphysiolysis lenta or acuta) both belong to the same

symptomatic complex of juvenile slipped femoral epiphysis. Both conditions have the same etiology, and identical anatomopathologic pictures, namely, aseptic necrosis of bone. Polyglandular functional disturbances at puberty, as well as constitutional deficiencies and changes in weight distribution play an added role in the development of these conditions.

The author reviews the diagnostic characteristics and typical roentgenologic findings of the disease, emphasizing the difficulties in differential diagnosis with chronic and specific inflammatory processes. He reports on his experience in the treatment of 3 patients with epiphysiolysis of the femoral head seen at the Heidberg Hospital, Hamburg, Germany. All were treated by nailing of the neck of the femur following a 2 to 10 weeks' period of extension allowed for the reduction of the displacement. The first patient recovered uneventfully with complete functional restitution. The other two developed some degree of stiffness in the hip joint within 1 year following surgical intervention.

The various elements that may be responsible for the poor results are discussed and evaluated. Among these are diagnostic errors, wrong operative indications, and wrong techniques. Metalosis, or intolerance of young bone tissue for metal (V2 A, V4 A and vitallium as well), should finally be attributed to the otherwise unexplainable chondral and subchondral destruction and atrophy encountered in tissues surrounding the hip joint. Metalosis following the insertion of rust-proof metallic prostheses may develop by ionization at weight-bearing points, or as the result of damage to the finely polished surface of the nail causing structural changes in the metal, and favoring corrosion (Nicole). This condition manifests itself by: (1) bone resorption around the prosthesis, revealed on x-ray films by calcific atrophy of bone; (2) new bone formation around the prosthesis; and (3) softening of surrounding cartilage and bone, causing the destruction of articular surfaces.

In conclusion, the author suggests that the use of bone grafts (tibiaspan, fibulaspan) instead of metallic pins or nails, and additional multiple hole-drilling according to Kirschner's method, followed by immobilization may be the answer to the problem.

—*Fernand R. Schmidt, M.D.*

ORTHOPEDICS IN GENERAL

Considerations on Some Statistical Data Regarding Operative Procedures for Poliomyelitis (Considerazioni su alcuni dati statistici in tema de interventi chirurgici nella poliomielite). Vittorio Genta and Giuseppe Canepa. *Arch. chir. ortop. med.*, 1955, 20: 73.

In the past 20 years, 719 postpoliomyelitic patients were seen at the Santa Corona Hospitals in Pietra Ligure (Italy). This group does not include patients who were seen ambulatorily, and whose follow-up study was thus rendered impossible, nor the patients still under treatment. The authors review their experience, keeping in mind three particular questions: (1) how many operative procedures destined only to correct deformities and not to obviate permanent damage caused by the disease can be prevented by adequate conservative treatment; (2) at what time in the course of the disease do these become necessary; 3) what are the underlying causes leading to deformities that subsequently justify these procedures?

One hundred and ninety-four patients (27%) were seen within 2 years following the acute onset of the disease, and 525 (73%) were seen beyond this admitted period of recovery. Three hundred and eighty patients (54%) were operated upon, and 919 operative procedures were carried out, an average of 2.4 operations per patient. Of these procedures, 205 were exclusively performed for the correction of deformities already present and stabilized at the time of admission. Thus, at the most, only 33.2% per cent of the operative procedures could possibly be avoided or prevented.

A total of 376 operative cases (54%), of which 194 were seen during the first 2 years and 80 during the subsequent 3 years following the onset of the disease, were consequently operated upon during the course of the first 5 years of their disease, in the regenerative stage in which careful and continuous orthopedic supervision should prevent the appearance of deformities.

Deformities requiring surgical correction were mostly of the inferior limb; 101 involved the hip, 122 the knee, and 82 the ankle. All other procedures destined to correct vicious postures of the feet due to muscular contractures or bone deformities were excluded.

Surgical treatment of poliomyelitic patients should not be begun normally until the end of the recuperation phase, at the time when sequelae are stabilized, and nothing more can be expected from conservative treatment. In 24 per cent of the cases seen by the authors, this was rendered necessary within 3 years of onset of the disease.

The authors conclude that deformities were caused mostly by inadequate follow-up examination of the lesions and muscular equilibrium during the phase of recuperation of the disease, or immediately thereafter; by the absence or inadequacy of proper orthopedic prostheses, especially in the first period of treatment; by a deficiency in the preparation of the patient to static position; and by the lack of systematic follow-up of patients in specialized centers.

—*Fernand R. Schmidt, M.D.*

Osteosynthesis in the Treatment of Fractures; Immediate and Late Results (L'osteosintesi nella cura delle fratture risultati recenti e lontani). A. Acquati. *Chir. org. movim.*, 1955, 41: 1.

The author presents the immediate and late results in 277 cases of fractures of the extremities which were treated in the surgical wards of the Civil Hospital at Monza, in northern Italy, during the past 5 years. No case histories are given, but an extensive analysis of statistical material is presented, which can be summarized in a few general conclusions, the most important being that modern osteosynthetic material and methods afford results which justify a wider use than is generally appreciated. A number of before-and-after roentgenograms are appended, demonstrating the usual types of wiring, Putti banding, Lane plate types of metallic osteosynthesis, and fixation with screws; the unusual thing about these devices is that they are applied in places where one does not

usually see them. There is always observable solid healing without apparently any effects on the bone density and, frequently, without the formation of any evident callus; certainly the formation of callus is not as abundant as would be expected about fractures which have healed without the use of osteosynthesis. The roentgenographic reproductions should be consulted in the original text.

In general, osteosynthesis may be employed at any age, from infancy to advanced senescence. Of the 277 patients operated upon, all recovered. The two imperative requirements were strict asepsis and careful hemostasis.

In the author's experience the Putti bands are best adapted to spiral or oblique fractures of the diaphyses of the long bones, such as the femur, humerus and tibia. In some instances with pronounced obliquity of the fracture line the bands may be advantageously combined with other types of fixation such as plating or screw fixation.

Plating finds its most common indication in transverse fractures of the long bones. The author does not favor long plates, since he believes that the more foreign material placed in the tissues, the more marked the tissue reaction. The plate is never more than 12 cm. in length. On the author's service, the operation of osteosynthesis is followed routinely by immobilization of the limb in a plaster cast for varying periods of time.

The osteosynthetic material applied is generally left in place permanently. Leaving out of consideration the psychosomatic reaction of the patient towards the presence of the metallic material, about the only indication for its removal is infection, especially infection which has involved the fracture itself. The author does not believe that osteosynthetic substances, particularly those composed of the newer metals (titanium, vitalium and metallic alloys) are likely to cause infection, but they seem to be capable of maintaining an infective process once it has become established. A particularly large number of metallic appliances have had to be removed in instances of fractures of the tibia, which necessity seems to be closely related to infection. The infections tend to clear up after removal of the material, after which the osteosynthetic fixation may be renewed with undisturbed healing of the fracture.

In the attainment of results, nothing will compensate for the failure to secure exact reduction of the fracture fragments, and for the absence of experienced and skillful surgery. —*John W. Brennan, M.D.*

The Clinical Evaluation of Freeze-Dried Bone Grafts. Chalmers R. Carr and George W. Hyatt. *J. Bone Surg.*, 1955, 37-A: 549.

The tissue bank provides for sterile postmortem procurement of bone, in addition to facilities for chilling, freezing, and freeze-drying. The experimental surgical evaluation of freeze-dried tendon, fascia, and dura is currently being investigated by the research members of the team at the Naval Medical Research Institute.

The harvesting average is thirty-five one-ounce cortical-bone deposits and thirty-five one-ounce ground cancellous-bone deposits per cadaver. The rejectage from bacterial contamination averages 8 per cent. Immediately after procurement, the bone is placed in a glass unit and is stored at −70 degrees centigrade prior to processing. The details of the freeze-dried technique are given. Throughout the processing and final capping, the bone remains in its original glass unit. With freeze-dried bone, the vacuum is required to prevent absorption of moisture from the atmosphere. The average freeze-drying cycle for bone takes 2 weeks.

Freeze-dried bone is moderately friable in its dry state; however, it will apparently regain its elastic physical properties when physiologic saline solution is added to the deposit until the operation is done. Cortical bone is usually reconstituted in this manner over night. The ground cancellous bone is easier to pack into the operative area if it remains in the dry state. This bone is then reconstituted in the patient's hematoma.

Experimental evidence that freeze-dried homogenous bone grafts heal at a slower rate than do autogenous bone grafts has not been clinically appreciable thus far. There is no clinical evidence of untoward immunological response.

Of the 41 patients subjected to spinal fusion, there were 2 with wounds which drained postoperatively. Both wounds cleared without evidence of bone sequestration. After 8 months in one case and 12 months in the other, no osteomyelitis was evident.

In the treatment of fractures of long bones, freeze-dried bone grafts were used in 51 patients. An adequate follow-up was available for 42 patients. In 25 there was pre-existing delayed union or nonunion which required surgical intervention. In 17 cases grafts were inserted as part of the open reduction of fresh fractures; in all of these, the fractures united satisfactorily. There were four failures in the group with pre-existing delayed union or nonunion.

There were 13 patients in whom bone cavities were packed, and there was adequate follow-up in 12. There were 9 successes and 3 failures.

The cases in which the graft had a fair chance of success, and did not consolidate were 4 instances of nonunion (two in the radius), 3 instances of spinal fusion, 1 enchondroma excised from the metacarpal bone, and 1 case in which a metacarpal bone graft was done.

The authors believe that when bone is used, even for firm fixation, there is less likelihood of nonunion from absorption than when rigid metallic plates are used. It apparently forms a trellis for bridging callus.

The freeze-drying process has the disadvantage of high initial cost in equipment, time, and technical personnel. The process is not practical for adoption by the average hospital.

The technique avoids additional incisions; the operative time is shortened; and select grafting material —either cancellous or cortical—is abundantly available. —*C. Fred Goeringer, M.D.*

A Case of Dupuytren's Contracture Involving the Hand and Foot in a Child. A. E. Goetzee and H. O. Williams. *Brit. J. Surg.*, 1955, 42: 417.

The case is described of a 14-year-old boy who presented typical findings of Dupuytren's contracture in the right hand and foot. Changes had been present in the foot for 4 years, and in the hand for 3 years.

Surgical excision of the palmar and plantar fascias was done. The pathologic findings were those characteristic of Dupuytren's contracture. The outcome of this treatment was excellent.

The authors have been unable to find any record of another case of this disease in the hand and foot of a child, and believe it to be an extreme rarity.

—*Charles T. Ryder, M.D.*

Primitive Mycetoma of the Foot; Madura Foot (Sul micetoma primitivo del piede: piede di Madura). A. Franz and B. Albertini. *Chir. org. movim.*, 1954, 40: 412.

The case histories of 3 women suffering with Madura foot are presented. Their ages were, respectively, 61, 67 and 23 years. In none of the patients was the general health affected. In fact, the 23 year old patient, when examined, was found to be 3 months' pregnant. In the 61 year old patient the condition had been present for 7 years; in the 67 year old patient it had been present for 28 years; and in the 23-year-old patient for 4 years.

The roentgenologic examination in the 61-year-old patient disclosed the typical cribriform changes in the calcaneus with a general osteoporosis of the bone and marked thickening of the periosteum. In the 67-year-old woman there was no evident involvement of the bony skeleton. In the 23-year-old woman there was observed only a mild diffuse atrophy of the bones of the foot, accompanied by an odd, circumscribed loss of shadow density in the head of the calcaneus at the level of the sustentaculum tali; at this place there was a large fistulous passage.

In the 61 and 67-year-old patients the diagnosis was confirmed by microscopic examination of the granules encountered in the discharges from the fistulas. In the 23-year-old patient the diagnosis was confirmed by biopsy.

Figures 3 and 6 in the original text show the typical findings of actinomyces; these, however, are not colored photomicrographs; they were painted by a medical artist to show the microscopic appearance of the actinomyces organism in the 61 and 67-year-old patients; figures 11 and 12 show the microscopic findings in the 23-year-old patient; here the findings were sufficiently typical of actinomycosis to permit the diagnosis, although the causative agent was not identified; there were certain rounded defects in the tissue sections which suggested that the characteristic mycelial masses had been present but lost somewhere in the process of fixing and staining.

The 61 and 67-year-old patients refused operation and were lost to follow-up; the 23-year-old patient underwent excision of the mycetoma, although she was not cured; 10 years later, despite the fact that the soft tissues appeared to be practically normal, there was still evidence of bone involvement; the original defect at the level of the sustentaculum tali was still visible on lateral roentgenography; the tibiotarsal, mediotarsal and subastragalar joints were quite rigid and there was evidence of periosteal reaction of the fibula and lower third of the tibia.

From their experience with cases observed at the Rizzoli Institute, Bologna, Italy, and from a review of the literature, the authors believe that the treatment of mycetoma is strictly surgical. Treatment with iodides does not seem to result in a complete cure and the recent work of Costigan and other authors with penicillin, streptomycin, and the sulfonamides is still insufficiently documented. In considering the surgical procedure, the authors make a distinction between superficial processes confined to the soft tissues, where excision might be justified, and the deep processes involving the bone, where amputation seems to offer the only prospect of cure.

—*John W. Brennan, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

The Present Status of the Surgical Treatment of Varicose Veins with Special Emphasis on Vein Stripping. CHARLES A. GRIFFITH and HENRY N. HARKINS. *West. J Surg.*, 1955, 63: 245.

THE AUTHORS trace the introduction of vein stripping before World War I, its abandonment by all but a few surgeons between the two wars, and its revival since 1937. They discuss its place in the over-all surgical treatment of varicose veins, and emphasize the importance of coincident high ligation and of thorough division of the branches of the greater saphenous vein at the region of the fossa ovalis. They also discuss the importance of the lesser saphenous vein, accessory saphenous vein, and large varicose branches and plexuses.

It is believed that most patients with varicose veins severe enough to warrant surgery will benefit from a surgical procedure which may include: (1) high ligation of the saphenous vein at the fossa ovalis; (2) ligation and division of all branches at the saphenofemoral junction; (3) careful inclusion of both branches of a bifid saphenous in the surgical procedure; (4) stripping of the greater saphenous vein from groin to ankle; (5) excision of large varicose branches and plexuses; and (6) stripping of the lesser saphenous vein. From these six fundamental procedures, a choice can be made to treat surgically the individual patient with varicose veins. —*Ely Elliott Lazarus, M.D.*

The Physiology of an Arteriovenous Fistula. EMILE HOLMAN. *Am. J. Surg.*, 1955, 89: 1101.

THE PRESENT article is a reprint of one originally published in Archives of Surgery in 1923. Cardiac hypertrophy and proximal dilatation of the artery have been associated with arteriovenous fistulas so frequently that it has long seemed highly probable that there must be some causative relationship between the two. Halsted collected 447 cases of arteriovenous fistulas of the larger vessels recorded in the literature. In 57 of these there was proximal dilatation of the artery (12.7%). Nine of 21 cases studied in the Johns Hopkins Hospital, Baltimore, showed proximal dilatation (43%); six of the 21 cases showed enlargement of the heart (28%). Of the 447 recorded cases, cardiac dilatation and hypertrophy were noted in 16 instances (4%).

The report of a case studied and treated at the Johns Hopkins Hospital in 1922 is presented in detail.

Normally, the circulatory system is a single closed system (heart, arteries, capillary bed, and veins) with a single pressure and a single peripheral resistance. The mean systemic pressure in such a system varies according to alteration in total capacity of the system by contraction or relaxation of the vessel walls, total volume of circulating fluid, heart beat and cardiac output, or peripheral resistance. Following the production of an arteriovenous fistula, there is an upset of this balance and a number of compensatory changes occur. The original system (a) consisting of heart, arteries, capillary bed and veins, now gives place to two systems supplied from a common source, the second system (b) consisting of heart, artery, fistula and vein; thus there are two systems with a common source of supply, but with a tremendous difference in peripheral resistance. The blood flows along the line of least resistance so that there is a tendency for practically all the blood to flow through the second system (b) if the difference in resistance through the two systems is great enough. To maintain a flow through the original system (a), it is essential to maintain a comparatively normal general pressure so that blood will flow through (a) as well.

The readjustments which occur following production of an arteriovenous fistula are as follows:

There is a great decrease in peripheral resistance resulting in an immediate fall in blood pressure. To compensate for this fall in blood pressure, the cardiac output is increased by an increase in force of cardiac contraction and an increase in rate of contraction. This leads to cardiac hypertrophy. Because of the lower pressure in the second system (b), a larger volume of blood is diverted through this route. To accommodate this increased volume of blood there must be widening of the blood stream, especially of the distensible arterial wall and vein. In a large fistula, practically all the blood volume would be diverted through the second system (b) if it were not for the resistance to distensibility offered by the vessel walls. In addition the fistulous opening offers resistance to flow through it. If it is small, resistance to flow through it is high; if it is large, resistance to flow is low. The dilatation of the artery depends largely upon the cross section of the fistula, that is to the resistance to flow through it. Dilatation will occur only if the fistula is larger in cross section than the cross section of the artery and dilatation will continue until these cross sections are equal. A narrow slit will afford more resistance than a rounded opening, a small opening more than a large opening. Obliteration of the fistula by digital pressure (clinically and in experimental animals) causes a rise in blood pressure and a fall in pulse rate. The fall in pulse rate is due to increased filling of the aorta with an increase in aortic pressure and stimulation of vagal depressor fibers in the arch of the aorta.

The author concludes that both the proximal arterial dilatation and the cardiac hypertrophy and dilatation are explicable on purely physiologic grounds. The proximal dilatation of the artery is dependent primarily on an increase in the total volume of circulating blood and more particularly on an increase of blood flowing through the heart, artery, fistula, and vein. Cardiac hypertrophy is a response to the increased work necessary in handling the increase in volume of blood flowing through the heart per unit of time. Dilatation is the result of a general dilatation of the system, heart, artery, fistula, and

vein, produced by the increased volume of blood flowing through it. —*Robert Paradny, M.D.*

Abnormal Arteriovenous Communications in the Distal Portions of the Extremities; Their Visualization (Communications artério-veineuses anormales des extrémités des membres; leur mise en évidence). R. LEGRAND, J. DESRUELLES, A. GÉRARD, and R. CORDIER. *Presse méd.*, 1955, 63: 793.

DIRECT ANASTOMOSES between the arteries and veins may be of different types: (1) acquired arteriovenous aneurysms, (2) congenital fistulas with or without hypertrophy of one extremity (Parkes-Weber syndrome), and (3) others. These types are easily visualized by phlebography.

The present article deals with another type of abnormal arteriovenous anastomosis which cannot readily be demonstrated by phlebography. Here multiple communications exist between arterioles and venules of very small lumen. They are of clinical interest because they may play a role in the pathogenesis of varicose ulcers, acrocyanosis, and similar disturbances.

Elevation of the oxygen saturation of the venous blood (78 per cent in one of the authors' cases) and of the skin temperature are characteristic signs of these conditions; however, the best evidence is given by serial arteriography with exact chronometry. Markedly accelerated and complete filling of the veins, about 9 seconds after the injection of contrast material in the main artery (femoral or brachial) is characteristic of the condition.

The authors report 4 pertinent cases. The clinical signs were cyanosis of the involved extremity, edema, ulcers of the skin, and other circulatory disturbances. Although, for optical reasons, the anastomoses cannot be made visible directly if the lumen of the communicating vessel is 0.1 mm. or less, the acceleration of the filling of the venous system after arteriography is a definite indirect proof of the condition.

For the clinician, it is of special interest that the condition seems to be reversible. In 2 of the authors' cases cure was obtained by spasmolytic drugs and cortisone. —*Werner M. Solmitz, M.D.*

The Storage and Use of Arterial Grafts. R. E. HORTON. *Brit. J. Plast. Surg.*, 1955, 8: 9.

THE INDICATIONS and contraindications to the use of homologous arterial grafts, together with case reports are presented in this article. The authors emphasize that the grafting of arteries is an operation which has a limited but now well established place in surgery, though only time can tell what the late results of grafting will be. If disappointments are to be avoided, however, great care must be taken in the selection of atheromatous cases, and the collateral circulation must never be interfered with.

At the University of Bristol, homologous arterial grafts are taken in the mortuary from a subject under 40 years of age who has died free of transmissible disease, usually the result of an accident. The grafts are taken within 12 hours of death, with full aseptic precautions. They are cut into suitable lengths, placed in sterile pyrex tubes, and a rubber bung is inserted. The sterile part of the operation is now completed. A freezing mixture is prepared by adding carbon dioxide snow to methylated spirit until a temperature of about −70 degrees C. is recorded on an alcohol thermometer. The pyrex tubes are inserted into this mixture in turn for about 3 minutes. At the end of the 3 minutes the grafts are transferred to the bank for permanent storage. A commercial deep-freeze operating at about −20 degrees C. is suitable. When a graft is required, the selected tube is taken to the theatre. The bung is removed and the tube is filled with saline at 100 degrees F. As the graft floats free it is poured into a bowl of warm saline. It is immediately ready for ligation of its branches and insertion into the defect.

In placing the graft, it is essential that the minimum number of collateral vessels be damaged. If free sacrifice of the collaterals were followed by thrombosis in the graft a disastrous result might follow.

Indications for arterial grafting include trauma to the femoral or popliteal arteries, after resection of aneurysms or tumors, and some cases of primary arterial thrombosis.

The prognosis of femoral and popliteal traumatic injuries has been immensely improved by grafting, but, as with embolectomy, the flow must be reestablished within 8 to 10 hours at the most.

Peripheral aneurysms may be due to trauma, syphilis, or atherosclerosis. The use of an arterial graft makes radical treatment possible without detriment to the circulation. A case report is included here.

Primary arterial thrombosis is a rare condition which occurs in young adults. The symptoms are usually incapacitating, for there is severe ischemia with claudication in a young person who is otherwise in excellent health—an ideal combination of circumstances for grafting.

In the treatment of tumors, a number of cases are suggested. Pelvic tumors and carotid body tumors in which resection of the neoplasm might require an arterial repair are amenable to arterial grafting.

Atheroma is by far the most common cause of arterial obstruction, and in some cases reconstructive surgery will afford dramatic relief. Surgery to the main arteries of the leg is justifiable only when the disease is particularly severe in the limbs and spares the coronary and cerebral circulations.

It is obvious that no local surgery should be advised when the patient suffers from angina pectoris or the symptoms of cerebral atheroma. Locally, severe disease shown on the arteriogram adjacent to the length of complete block may render the operation too difficult to be worth while undertaking. The presence of a second block a short distance below makes grafting unwise as the absence of flow will result in early thrombosis. Occasionally arteriography shows that the block extends distally into the small arteries, and grafting is not possible.

In the author's series, the immediate success rate is 16 out of 26 cases (60 per cent). Three patients have died—2 with gangrene from coronary thrombosis, and 1 patient, on heparin, from retroperitoneal hemorrhage after an iliac graft. In addition, there have been 3 cases of late thromboses, but in only one of these was there a thrombosis of the graft alone.

This is a remarkably concise article that contains an abundance of practical information.

—*Frank W. Pirruccello, M.D.*

Anastomoses and Grafts in the Venous System with Special Reference to Growth Changes. LESTER R. SAUVAGE and SIGMUND A. WESOLOWSKI. *Surgery*, 1955, 37: 714.

A VERY INTERESTING experimental study was made of the fate of grafts in the thoracic vena cava of the growing pig. The results of the studies of anastomoses and grafts in the thoracic interior vena cava of the growing pig indicate that the venous anastomoses grow normally in the absence of suture restriction. Fresh venous autografts maintain the characteristic of normal veins. Aortic homografts and orlon tubes of the type studied were not suitable for use in veins. In the present study, the authors found a close similarity in the fate of anastomoses in fresh autografts of the arterial and venous systems of the growing pig. In each system there is a normal anastomotic growth in the absence of suture restriction and the autografts resemble the parent vessel in all obvious respects, both grossly and microscopically. —*John E. Karabin, M.D.*

BLOOD; TRANSFUSION

Experimental Observations on the Function of the Blood-Storage Organs in Humans (Experimentelle Untersuchungen ueber die Blutspeicher beim Menschen). FRANZ BAUMGARTL and FRITZ ZUREDA. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 280: 382.

TWENTY healthy male volunteers underwent large phlebotomies by which an average of 1,250 c.c. of blood was withdrawn. During, and for a day after this procedure determinations of the protein-bound radioiodine (I^{131}) were done periodically, to clarify the role which the blood-storing organs play in the regulation of the circulating blood (-plasma) volume. The persons were allowed nothing by mouth on the day of the phlebotomy and for the time of study, and no coffee or tea was served in the periods before and after the test.

Sixty per cent of the persons were able to replace 60 per cent or more of the blood loss during the phlebotomy. In 45 per cent of all cases there was replacement of from 80 per cent to 100 per cent of loss and in a few cases an excessive replacement occurred. The period following the phlebotomy was characterized by marked fluctuations in the circulating plasma volume. After the initial (compensating) response, there was a gradual decrease of the circulating plasma volume within 1 to 2 hours in the majority of cases, followed by a slow return to normal values in the course of the next 20 hours. However, there was marked variation in the patterns, with increases and decreases. By concomitant plasma protein determinations, it was ascertained that these variations represented true changes in circulating plasma volume by the action of the blood-storing organs, and not changes due to shifts of intracellular and extracellular water.

In a few cases all of the blood that had been withdrawn was re-infused some 16 minutes thereafter. This replacement did not prevent the marked responses observed in the other cases, as had been expected. On the contrary, the fluctuations in the circulating plasma volume were greater than in the other group. This seems of particular interest to the surgeon in that blood losses should be replaced immediately in equivalent amounts, to prevent violent fluctuations in the circulating blood volume during the postoperative period, which are an additional burden for the circulation. —*Fritz H. Moser, M.D.*

SURGICAL TECHNIQUE

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

The Late Results of Finger-Tip Injuries. T. L. BARCLAY. *Brit. J. Plast. Surg.*, 1955, 8: 38.

AMONG a series of patients with hand injuries, who were treated in the Plastic and Maxillofacial Unit at St. James's Hospital, Leeds, and whose cases were reviewed after the lapse of at least one year or more from the time of the injury, 66 were found to have sustained loss of the tip of a finger, or the tip of a thumb, as the sole lesion.

Three methods of treatment of skin loss from the tip of a digit were discussed: (1) amputation proximal to the site of injury to allow closure of the wound; (2) Free grafting (split or whole-thickness skin); (3) pedicled grafting.

Amputation is the obvious choice in cases where there is much comminution of the bone of the terminal phalanx; again, a simple free graft is the obvious choice in cases of skin loss without exposure of bone or fractures. In the majority of cases, however, there is loss of the whole or part of the pulp of the finger, with exposure of bone, but without fracture. By first principles, a pedicled graft is indicated, but only if one is sure that the result will be satisfactory and that return to work will not be delayed, because in these doubtful cases it is quite easy to trim the bone end until it will accept a free graft, or to trim it still further and close the wound.

The author believes that sacrifice of length is not usually necessary, since pedicled flaps to the finger tips do give satisfactory results, and return to full employment is not delayed as long as when other methods of treatment are used. Further, amputation stumps are often too tender for heavy work until 2 to 3 months have elapsed, and the majority of industrial employees cannot do their work if the finger is covered to minimize painful stimuli. The injured digit is clumsy and time is needed for the patient to overcome this.

One patient, a man 56 years of age, who had been treated by a cross-finger flap, had permanent limitation of flexion of the donor finger. It appears advisable to consider the possibility of stiffness in the donor finger when contemplating a cross-finger flap in patients over 50.

Patients who were treated by pedicled grafts were confined to the hospital longer than those treated by other methods.

Flaps from the thenar or hypothenar eminence gave less satisfactory results than cross-finger flaps because of tenderness in the grafted donor site which sometimes persisted for more than 2 years. Flaps from the palm may fail because of the narrowness of the flap and because of difficulties of immobilization.

Cross-finger flaps, cross-forearm flaps, and thoracic flaps were used in reconstruction of the thumb tip.

Fifty-two finger-tip injuries of more than one year's duration were analyzed. The findings showed there was no significant difference in the length of time the patient was absent from work, whether the injury was treated by amputation, free grafts, or pedicled flaps. Pedicled flaps gave the most acceptable results.

Fourteen cases of skin loss, with or without loss of bone, of the distal phalanx of the thumb were examined at least 1 year after the injury. All had been repaired by pedicled flaps, with primary healing. It appeared that in most industrial occupations, length of the distal phalanx of the thumb was not of particular importance, only 2 out of the 14 patients having had to change their occupation. Lack of sensation and/or loss of the nail caused the only noticeable disability.

—Frank W. Pirruccello, M.D.

Nail-Bed Injuries. ADRIAN E. FLATT. *Brit. J. Plast. Surg.*, 1955, 8: 34.

IN THE AUTHOR'S experience, the majority of injuries which damage the nail or its bed are usually treated conservatively by various forms of dressings; the nail bed is left to granulate and the raw area is left to heal by scar tissue. The result of this treatment is only too often a distorted nail and a sensitive scarred digital tip. In the Accident Department of the London Hospital, and in the Hand Clinic, strict rules of treatment have been laid down for these injuries.

A close distinction is drawn between injuries which involve the nail and the nearby skin, and injuries creating actual pulp loss. In cases in which pulp loss has occurred, even though there may be associated nail damage, treatment is directed to restoring the pulp volume and finger-tip skin. The nail injury becomes a secondary consideration in treatment. Where there has been partial or complete loss of the nail and its bed, a thin split-skin graft is applied to the wound.

Where, in addition, there has been loss of actual finger-tip skin, a graft of varying thickness is cut so that the thick portion is applied to the pressure-bearing area and the thin portion to the nail-bed area.

The grafts are taken from the flexor aspect of the forearm of the damaged hand, the donor area being infiltrated with 2 per cent xylocaine. All these grafts are sewn into place. After cutting back the area of damaged nail for about one-tenth of an inch, one or two holes are drilled in it so that sutures may anchor the graft firmly. A small pressure pad is held in place with a Tubegauz dressing.

Crush injuries occur about equally commonly in hand or foot. It is impossible to predict the exact extent of the damage to the germinal area, and treatment should be directed to preserving the length of the digit. A secondary operation may be necessary to deal with nail spurs which frequently develop subsequently.

In cases in which the nail is still loosely attached, it should be sutured back into place to form a protection for the nail-bed area while the new nail is growing in.

When the nail is completely detached and the nail-bed surface is damaged, the treatment of choice should be the application of a thin split-skin graft.

With the graft sewn into place and the additional protection of a leather finger-stall provided where necessary, it is possible to keep the majority of patients at work throughout their treatment. There are occasional complaints of a day or two of soreness from the donor area.

The average length of time that dressings are kept on has been from 3 to 4 weeks. Though actual figures cannot be produced, the author is confident that the present results with this method of treatment are better than those previously obtained, and certainly much less working time has been lost.

—*Frank W. Pirruccello, M.D.*

Repair of Injuries to the Tendons of the Hand. R. F. Bogdanov. *Brit. M. J.*, 1955, 1: 1315.

The author, who is Director of the Institute of Traumatology, at Sverdlovsk, outlines certain principles governing the treatment of tendon injuries which have evolved in the Soviet Union. He cites the reports of 1,392 tendon sutures since 1936, with an average good result of near 75 per cent in flexor tendons, and near 90 per cent in extensors. Also, he notes that of 123 industrial tendon injuries in one report, 72 per cent were accompanied by serious skin, bone, or nerve damage.

Early surgical repair is emphasized. First aid measures to immobilize the hand in flexion or extension should be followed soon by operation, which may be done at any time with the support of antibiotics, even with associated injuries. The *sine qua non* is the availability of the experienced surgeon. That principle holds even in the so-called no man's land between the midpalmar and middle finger creases, when the wound is clean cut and fresh. However, if there is doubt concerning the latter, or if retraction of the tendon ends has occurred (laceration while in flexion) such that enlarged incisions must be made to search for the tendons at the expense of damage to the gliding mechanisms, or if the repair must lie within the fibroannular pulleys, or if there are extensive soft tissue or bony injuries, repair of tendon lacerations in the no man's land should be delayed. If primary suture is performed in the palm, capron sutures are used; silk is avoided.

The profundus tendon may be repaired primarily if it is lacerated distal to the bifurcation of the sublimis. Primary repair of the long thumb flexor may require a free graft. The proximal end usually lies between the heads of the short flexor muscle.

For the most part, the repairs are carried out without tourniquets, with local anesthesia, and use of the suture technique of Cuneo.

Delayed suture of tendons in the palmar area is done after soft tissue and bony injuries have healed, and when joints have been freed. The delay, 21 to 45 days, is kept as short as possible to lessen the amount of fibrosis in the sheaths. Deep skin scars are excised at the time of tendon repair. Transverse incisions in the palm are used. Only rarely has it been necessary to use tendon grafts. When used, the paratenon is preserved on the graft, and the distal graft end is sutured to the terminal phalanx by a perforating, removable suture. Side-to-side suture of the graft to the proximal tendon is used, only to the profundus if both flexors are injured. Multiple flexor tendons are repaired in stages—two fingers at a time. Destroyed annular ligaments are replaced by free grafts or by flaps of lumbrical muscles. In this group of operations, the results were good in 25 per cent and satisfactory in 50 per cent. Secondary arthrodesis in partial flexion was used to improve function in 7 cases.

Lacerations beneath the carpal ligament are repaired by free grafts. Rupture of the extensor aponeurosis is repaired by suturing together the lateral bundles of the extensor mechanism in the dorsal midline.

Immobilization in plaster for 4 weeks is followed by physiotherapy. Corticotropin has been used to lessen scar formation. —*Leonard D. Rosenman, M.D.*

The Care of Open Injuries of the Hand and Fingers with Special Reference to the Treatment of Traumatic Amputations. Patrick Clarkson. *J. Bone Surg.*, 1955, 37-A: 521.

The author describes the treatment of open injuries of the hand and fingers, as seen in a teaching hospital the day of the accident. It is concerned principally with the question of primary skin healing and only indirectly with the repair and healing of tendons, nerves, and bone.

The upper extremity below the elbow is the part of the body that is most commonly injured, and these injuries account for a third to a half of the total casualties which have to be treated. It is important to note that the great majority of injuries in this series were small ones.

Open contusions are more severe than lacerations of the same extent, not only because of the higher incidence of damage to bone and other deep structures, but because of the progressive edema to which they are subject for the first 24 to 48 hours after injury, and because of the indeterminate extent of the deep-tissue loss in the early stages. Closure of the wound is accomplished by approximation, free graft, or by flap. The lacerations show a mean healing rate of 8 days and the open contusions a mean healing rate of 17 days.

In the treatment of these injuries, the patient accomplishes the primary cleansing himself, by taking about half an hour to cleanse the whole limb below the elbow in a 1 per cent detergent. Local analgesia is then accomplished. Over 99 per cent of the patients were so treated. A second detergent is then used in cleansing the wound because of its effect on gram-negative organisms.

The best repair for the common important fingertip injuries is one by "like" tissue; that is, by a thenar or palmar flap.

Resuture of the severed part is only practicable when less than half of the distal phalanx is involved. The Gillies method of skinning an amputated digit, burying it in the flank, and then attaching it and the overlying skin as a tube pedicle to the stump of the finger can give a very satisfactory result, but the number of operations makes this procedure justifiable only for selected cases. Re-amputation is used when extensive proximal injuries make it clear that the digit has no useful future. The tendons are not sutured across the bone end, as this limits later mobility.

A thin split-thickness skin graft can be expected to "take" uniformly and to be stable on most traumatic

amputation stumps of the fingers. It is, however, poorly sensitized, yellow, and unsightly; it does not restore normal convexity to the pulp. Its use is limited to elderly patients and to the medial three digits. When bone is exposed in the stump, the anterior portion of the bone is removed to allow the soft pulp to fall back into contact with the nail bed (after removal of about 4 mm. of the nail). Thenar and palmar flaps, which give a repair by "like" tissue, are the best primary methods for most injuries. The repair can be done safely under local analgesia on out-patients. Repair of the secondary defect must be meticulously carried out and is best done by a dissected full-thickness skin graft cut to the pattern of the defect. With this method of treatment the donor site causes no trouble.

—*C. Fred Goeringer, M.D.*

ANESTHESIA

Basal Anesthesia "Diparcol-Dolosal" in Geriatric Surgery and for the Patient Presenting a Poor Risk (L'anesthésie de base "diparcol-dolosal" en chirurgie gériatrique et chez le malade représentant un mauvais risque). CLAUDE MARTIN. *Anesthésie*, Par., 1955, 12: 335.

THE AUTHOR discusses the experiences with a series of 120 patients under basal anesthesia consisting of a mixture of diparcol and dolosal with or without local anesthesia, curarization, or a very light general anesthesia.

The pharmacology of the two drugs is discussed briefly. Diparcol has a sleep-inducing effect and produces amnesia which sometimes is even retroactive. Dolosal (identical with demerol) is analgesic and depresses the basal metabolic rate. The drugs have a synergistic effect on the autonomous nervous system: dolosal is vagolytic and spasmolytic, and diparcol is antisynaptic in its effect on the central nervous system as well as on the parasympathetic ganglia. In addition it is also spasmolytic, mildly adrenolytic, and antihistaminic. Dolosal slows down the respiration but increases the respiratory amplitude and dilates the bronchi, as does also diparcol. The mixture of both drugs results in respiratory depression by about one-third. The toxicity of both drugs in the dosage used is negligible.

The mixture produces a twilight sleep, consisting of somnolence and analgesia without producing deep sleep. It permits smaller interventions without the addition of local or general anesthesia or drugs of the curare group. Even intubation is possible in this twilight sleep without the addition of any other drug, although the glottic reflex is preserved.

As a suppository 120 mgm. of nembutal are given the night before the operation and the dosage is repeated an hour before the intervention, and 50 mgm. of phenergan are injected intramuscularly an hour before the operation. Immediately before the operation the mixture of diparcol and dolosal dissolved in 20 c.c. of distilled water is given intravenously; the dosage of the drugs is not stated in the article. The intravenous injection should be given very slowly to prevent disagreeable tachycardia and attacks of coughing.

A series of 98 elderly patients were operated on under this type of anesthesia, 77 of whom were more than 70 years old. The operations performed included all kinds of major surgery, such as gastrectomy, sigmoidectomy, mammectomy, hysterectomy, prostatectomy, and amputations. If necessary the basal anesthesia was supplemented by nitrous oxide or by drugs of the curare group. The results were very satisfactory; there were 7 postoperative deaths among the 98 cases, none of which was caused by the anesthesia. There was no postoperative bronchitis or pneumonia. All patients, even those who were fully awake when brought to the operating room, had complete amnesia.

The only definite contraindications to the method are difficulties in the intravenous injection, as even one drop injected into the paravenous tissue causes severe necrosis. Whether the method is advisable in cardiac patients is still an open question. The author has used it in several cases without damage to the heart but he stresses that in these cases the intravenous injection should be given even more slowly to prevent initial tachycardia and respiratory depression.

Aside from geriatric surgery, the method has also been employed successfully in obese and alcoholic patients and in patients suffering from respiratory deficiencies such as emphysema and asthma.

—*Werner M. Solmitz, M.D.*

A Critical and Comprehensive Essay on the Hypophysioadrenal Phenomena Observed Under Neuroplegia and Artificial Hibernation (Essai critique et synthétique sur des phénomènes hypophyso-surrenaliens constatés sous neuroplégie et hibernation artificielle). H. LABORIT. *Anesthésie*, Par., 1955, 12: 369.

THE AUTHOR states that in 1950 he published the observation that after anesthesia supported by neuroplegic drugs, derivatives of phenothiazine, the postoperative eosinopenia is markedly reduced. This phenomenon is due to inhibition of the pituitary and adrenal glands. Numerous experimental papers on this subject have been published since and are discussed in this article.

The writer criticizes the experimental results obtained in small animals (rats) as they are not proper subjects for such experiments. A slow intravenous infusion is technically impossible, and rather massive doses of the drugs have to be given rapidly. This may cause a condition of shock and may lead to erroneous conclusions. Only in large animals (dogs) can the drugs be infused intravenously at a slow rate. This error in the technique may explain the contradictory results of several workers who believe they observed a corticotropic action of the drugs.

The writer then discusses in detail the mechanism of the endocrine action of the "lytic cocktail." He reviews the literature on this subject and presents a new hypothesis, namely, that the inhibition of the pituitary and adrenal function by the phenothiazine derivatives (chlorpromazine, diparcol, phenergan) is not caused by direct influence but, at least partly, by interference with the carbohydrate metabolism.

This interesting article, in which the author discusses in detail the physiology of carbohydrate catabolism, should be studied in the original.

—*Werner M. Solmitz, M.D.*

SURGICAL INSTRUMENTS AND APPARATUS

Free Nail Grafting. C. R. McCash. *Brit. J. Plast. Surg.*, 1955, 8: 19.

"The tips of the fingers in man represent the tactile horizon of the body. As end organs designed for the appreciation of such fine differentiation as that of roughness or smoothness, softness or hardness, they should be anatomically perfect if they are to fulfil their functions." Following this introduction, the authors go on to describe three methods of free nail grafting in 10 different instances, in an attempt to restore an acceptable normal appearance to the fingers.

The partial nail graft is described as a method in which the central section of the great toe nail with nail bed and matrix is used as a free graft. The graft extends right back to the root of the donor nail to include all the germinal matrix available.

The composite nail graft is usually taken from one of the lesser toes and consists of the complete nail, nail bed, and matrix, the nail fold on each side and at the root, and a thin shaving of the upper surface of the terminal phalanx.

The complete nail graft is one that is taken from one of the lesser toes and consists of the nail, nail bed, and matrix only, without bone or surrounding skin.

Six of the selected cases were burn deformities, 3 were cases of congenital brachydactylia, and 1 case was traumatic in origin. Composite grafts were used in 3 of the cases, complete grafts were used in 3, and partial grafts were used in the remaining 4 cases. Although the results in all are reported as successful, the authors emphasize that even though a graft appears to take well and become vascularized in the first 2 weeks, this does not necessarily guarantee a good end result. Exfoliation may take place at any time between the third and the eighth weeks, and the new nail may be only a thin plate lacking in character, or it may become coarse and horny. These points are well illustrated.

The results obtained from this small series of experiments indicate that the nail with its germinal matrix behaves like any other epidermal structure, being freely transferable on the same individual, and can retain in its new site its peculiar property of forward growth. In every case the graft took well initially, becoming vascularized within the first 2 weeks. Of the three methods of grafting employed, each yielded one really good end result, and it is of interest to note that these were the cases in which exfoliation did not occur. Although in all but one case a new nail grew after exfoliation, some were brittle and fragmented and others were horny in character. The ultimate success from a cosmetic standpoint appears to depend upon a complete take of both the germinal and sterile matrix along with a good digital blood supply and a smooth surface beneath the graft. A careful contouring of the recipient bed is therefore important, combined with firm fixation. The method described of passing wire mattress sutures through the end of the finger has been used in recent cases with satisfactory results.

Details of the technique along with colored photographs are included. —*Frank W. Pirruccello, M.D.*

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Cerebral Complications Following Cardioangiography. SHELLEY N. CHOU, LYLE A. FRENCH, and WILLIAM T. PEYTON. *Am. J. Roentg.*, 1955, 73: 208.

TWO CASES demonstrating complications of cardioangiography are reviewed. In each case the left brachial artery was cannulized and 70 per cent diodrast was injected (45 cc. in case 1 and 31 cc. in case 2).

The first patient, a 56 year old female, developed hyperemia, spastic contractions of the upper extremities, aphasia, weakness of the left side of the face, periods of generalized convulsions, and, finally, death within 8 hours. Autopsy did not reveal the cause of death.

The second patient, a 65 year old female, initially showed good tolerance to the procedure. While being returned to bed, however, she developed Cheyne-Stokes respirations. This was followed by a persistent hypotension with no other change in her condition for 24 hours. On the next day bilateral Babinski signs were elicited, followed by flaccid paresis of the arms. One month elapsed before she could sit up and carry on an intelligent conversation.

The neurological signs may be explained by the fact that the contrast media may disrupt the blood-brain barrier. This depends on the pressure of the injection and the concentration of dye. Damage to the brain tissue may result in a transient physiological disturbance or a severe necrosis with petechial hemorrhages and edema. The high concentration of dye may reach the brain via the cerebral or vertebral vessels directly during the retrograde arterial injection. This is more likely to occur on the right than on the left side because the subclavian artery gives rise to the carotid and vertebral vessels from a practical standpoint.

Hypotensive, vascular, and cardiac complications arise from the fact that the media are transient vasodilators and myocardial depressants in high concentrations. —*John J. Gaughan, M.D.*

Physiological Bronchography. CHARLES A. PRIVITERI. *Am. J. Roentg.*, 1955, 73: 958.

UTILIZATION of the effect of gravity and deep inspiration permits complete filling of the bronchial system with the patient in a horizontal position. Preparation, anesthetization, and catheterization of the trachea are done by any method desired. Fifteen cubic centimeters of lipiodol are pooled in the main stem bronchus on the side to be filled; then the patient is instructed to take a deep breath. If this does not accomplish entirely satisfactory filling, the patient is turned to the prone position and, if necessary, requested to take another deep breath. One hundred and seventy patients were examined by this method of physiologic bronchography. For the first 50 examinations, deep inspiration alone was used and during this period 12 cases showed incomplete filling. After introduction of the prone position, 125 examinations were carried out. The results were consistently satisfactory, and nonfilling was encountered only in pathologic bronchi.

This is a simple, efficient method of bronchography which is particularly applicable in debilitated patients. It should be useful also in children who are old enough to co-operate. Whether physiologic bronchography has diagnostic advantages over other methods of bronchography will have to be ascertained by further investigation. —*Lois Cowan Collins, M.D.*

Roentgen Examination of the Acute Abdomen: The Carman Lecture. BARTON R. YOUNG. *Radiology*, 1955, 64: 483.

THE AUTHOR, in his Carman Lecture delivered before the Radiological Society of North America, discusses the use of plain roentgen examination of acute conditions of the abdomen in various pathologic conditions. He indicates the various findings in these conditions, and variations from the usual techniques in the examinations. Diagnostic criteria for arriving at a diagnosis, as well as the differential diagnosis of acute abdominal distress are discussed. The pathologic physiology is well correlated with the roentgen findings and the article is recommended for complete reading by radiologists and surgeons who deal with the problem.

—*Moris Horwitz, M.D.*

The "Phantom Pain" of Patients with Gastric Resections (Der "Phantomschmerz" der Magenresezierten). B. GIMES. *Fortsch. Roentgenstrahl.*, 1955, 82: 605.

FOUR HUNDRED patients who had undergone gastric resection for ulcer were examined roentgenologically for various gastric complaints. The study was carried out in the period from January 1952 to September 1954, at the roentgenologic clinic of the University of Budapest.

Sixty-two of these patients complained of pain to the right of the gastric stump, that is, precisely in the area previously occupied by the resected portion of the gastroduodenal tract which had been removed. The pain was not constant, but appeared periodically and seemed to correspond with the periodically appearing preoperative ulcer pains. In these patients the roentgen findings were completely negative. There could be elicted no evident cause for the pains.

In seeking an explanation for the symptoms manifested by these usually highly neurotic patients, the author recalls the studies of Kiss and Ballon (*Arch. Surg.*, 1929, Vol. 19) who emphasized in their anatomical studies that the conditions surrounding these resections afforded ample opportunity for the development of neuromas of the central stumps of the pyloric plexus. The neuromas might be very small, but in these vegetatively labile individuals they could easily be irritated by any of the factors producing the original pain of ulcer and give rise to pains analogous to the phantom pains of amputation stumps in general. For this mechanism the author accepts the corticovisceral conception of visceral pains whereby the patient still

harbors pain-memories from the preoperative, active stages of the disease. The sympathetic character of this "memory" thus accounts for the periodic character of the phenomenon.

The phantom pain may be nothing other than pain in the central stump of the pyloric plexus with its amputation neuroma—pain which the patient refers to the region previously innervated by these nerves; the painful sensations are carried centrally by the sympathetic nerve supply to the pyloric plexus, and are projected back to the previously enervated region. R. Boller's study "Der operierte Magen," published in Vienna in 1947, has already called attention to this possibility. —*John W. Brennan, M.D.*

Preliminary Observations on Veripaque, a Colonic Actuator for Use With Barium Enemas. J. W. McLaren, J. B. King, and W. A. Copland. *Brit. J. Radiol.*, 1955, 28: 285.

The authors report their experience with veripaque, a colonic actuator with some structural similarities to phenolphthalein, in the demonstration of colon contraction for evacaution of the colon and the demonstration of small and even large lesions by mucosal relief technique of examination of the large intestine. They point out that frequently segments of bowel overlap each other and lie deep in the pelvis, to hide small filling defects, indicating that these handicaps can be overcome by the use of the medium they described, either by administration with the barium enema per se or perhaps by preliminary cleansing of the colon with a half strength solution of telipaque with water.

The authors prefer the use of veripaque over tannic acid, a medium used by many radiologists in producing excellent after-evacuation pattern roentgenograms of the colon. They describe their experience with the actuator in the demonstration of many types of intrinsic and extrinsic lesions of the large intestine. Their apparatus and their technique of administration of the medium is most meticulous and they indicate that it must be followed exactly to obtain satisfactory results. While the roentgenograms illustrating the medium are of excellent quality, they hardly indicate a great deal of advantage over the tannic acid technique mentioned. —*Moris Horwitz, M.D.*

The Value and Limitation of Roentgenographic Diagnosis of Adrenal Disease. E. F. Poutasse. *J. Urol.*, Balt., 1955, 73: 891.

The author briefly describes and evaluates the relative merits of the roentgenographic methods used by the Department of Urology of the Cleveland Clinic Foundation and the Frank E. Bunts Educational Institute for the diagnosis of various types of renal disease.

These methods include: plain abdominal film; excretory urography, the patient being positioned for the 15-minute film, so that the kidney and adrenal gland areas are in the upper third of the film, thus eliminating the need for retrograde pyelography in most instances; presacral oxygen insufflation; translumbar aortography in selected cases; and laminagraphy. In some instances, surgical exploration is performed.

The various types of renal disease discussed are: large nonhormonal adrenal tumors; pheochromocytoma; and the hyperfunction of adrenal cortex, considerable attention being paid to the adrenogenital syndrome and to the Cushing syndrome.

The author states that the greatest value of roentgenographic demonstration of the adrenal glands lies in the prospect of diagnosis of an adrenal tumor. This enables the surgeon to choose the best approach for the contemplated operation, depending on the size, location, and number of tumors. Visualization of normal or enlarged adrenal glands on both sides may also be important in the differential diagnosis of growth problems in childhood and virilization of females, often obviating the necessity of surgical exploration. In the absence of any roentgenographic findings, endocrinologic tests and other methods of examination may prove sufficiently reliable in cases of pheochromocytoma and adrenal cortical hypertension to justify operative intervention.

The article is illustrated with reproductions of roentgenograms and photographs of surgical specimens of typical cases. —*T. Leucutia, M.D.*

A Study of the Lymph Drainage of the Lower Limb with the Use of Colloidal Radiogold (Au^{198}). K. A. Hultborn, L. G. Larsson, and I. Ragnhult. *Acta radiol.*, Stockh., 1955, 43: 132.

In order to investigate the drainage from the lower limb, the authors injected Au^{198} in the skin and subcutaneous tissues of 5 patients with neoplastic lesions, and measured the uptake with a scintillation counter directed over the popliteal fossa and over the groin and iliac fossa.

Counts made between 2 and 72 hours after injection over the popliteal fossa in one case demonstrated an increase of activity from 1.1 per cent to 3 per cent; at the same time the activity increased in the groin and iliac fossa from 5.3 per cent to 14.5 per cent.

In each case an uptake of radiogold was demonstrated in the lymph nodes proximal to the inguinal ligament—in 2 cases, 7 cm. above that ligament. In one of these cases no uptake was demonstrated in the inguinal lymph nodes and in a second case uptake was found only in the most medial part of the inguinal lymph nodes.

The authors believe that this preliminary investigation shows direct lymph drainage from different parts of the lower limb to the iliac lymph nodes, and they suggest that these findings, corroborated, may alter surgical and radiotherapy to malignant diseases of the lower extremities. —*Moris Horwitz, M.D.*

A Study of the Local Roentgen Reaction on the Skin of Mice, with Special Reference to the Vascular Effects. Finn Devik. *Acta radiol.*, Stockh., 1955, Supp. 119.

The experimental work serving as the basis of this monograph was carried out at the Institutt for Generell og Eksperimentell Patologi of the University of Oslo, Norway. As the author states in the introduction, the main purpose was to study the pathogenesis of the tissue reaction to local roentgen irradiation, in an attempt to clarify the role of the vascular factor.

Hairless young mice, 6 to 8 weeks old, were used for the experiments. A skin flap was prepared on the back of the mouse and sewn to a plastic frame similar to

that employed in the Algire technique. Irradiation of the skin flap was carried out with a Philips Metalix unit by using the following factors: 50 kv., 2 ma., 1 mm. aluminum filter or no filter, 27 mm. distance from the focal spot, 1 sq. cm. field, a half-value layer of 1.1 mm. aluminum with 1 mm. aluminum filter and 0.3 mm. aluminum without filter, and dose rates of 677 roentgens per minute with 1 mm. aluminum filter and 2,550 roentgens per minute without filter. The set-up of the irradiation is described in detail and illustrated by photographs and diagrams. In most instances a single dose of 2,700 roentgens was used, which is called the "reference dose," but the effects of doses of 1,050 roentgens, 1,600 roentgens, 4,200 roentgens, and 15,000 roentgens were also studied.

The local roentgen reaction produced on the skin flap was investigated by: (1) direct observation of the flap and measuring of its thickness; (2) histologic examination; (3) intravascular dye injections of fluorescein, Evans' blue, phenol red, and India ink; and (4) a modified freeze drying technique, combined with dye injections, aiming to demonstrate the functional and morphologic state of the blood vessels.

The results of the investigation are given in extenso and discussed. Numerous illustrations of the main alterations observed are appended.

Some of the author's conclusions are, briefly, as follows:

1. The reference dose of 2,700 roentgens in one seance to a field of 1 sq. cm. causes an exudative dermatitis which is fundamentally the same as the skin reaction of other species, including man.

2. The acute skin reaction depends in the main on the effect of the roentgen rays on the epithelial cells. The first visible manifestation of this effect is the rather sudden appearance of a great number of abnormal mitoses in the epithelial cells. The inflammation which is part of the acute skin reaction is probably the result of the destruction of the epithelial (and connective tissue) cells. Regeneration of the epithelium is effected by the irradiated cells.

3. As regards the question of direct and indirect action of the irradiation, the evidence gathered by the author seems to point to the fact that the acute skin reaction is determined mainly by the direct effect on the epithelial cells. With the methods applied, no clear influence of the irradiated cells on normal cells could be demonstrated. It is emphasized, however, that the cell environment both during and after irradiation is of the greatest importance in determining the fate of the irradiated cell.

4. The observations made on the blood vessels indicate that the vascular factor is of secondary significance in the pathogenesis of the acute skin reaction due to irradiation. —*T. Leucutia, M.D.*

MISCELLANEOUS

Refractory Anemia Occurring in Survivors of the Atomic Bombing in Nagasaki, Japan. Robert D. Lange, Stanley W. Wright, Masanobu Tomonaga, Hirotami Kurasaki, and Others. *Blood.* N.Y., 1955, 10: 312.

The authors present 6 cases of refractory anemia occurring in atomic bomb survivors in Nagasaki, Japan. The diagnosis was confirmed by the classical triad, anemia, leukopenia, and thrombocytopenia, without significant enlargement of organs. Bone marrow and biopsy studies failed to reveal the presence of leukemia. In 5 of the cases the diagnosis was confirmed at autopsy. The fact that refractory anemia may occur as a late manifestation of exposure to atomic radiation is pointed out, and in the cases reported the condition occurred from four to six years after known exposure.

The authors state that 5 similar cases have been studied at Hiroshima, Japan and will be reported later. —*Moris Horwitz, M.D.*

MISCELLANEOUS

CLINICAL ENTITIES— GENERAL PHYSIOLOGICAL CONDITIONS

The Development of Plastic Surgery in Sweden. A. RAGNELL. *Brit. J. Plast. Surg.*, 1955: 8: 118.

AFTER THE FIRST WORLD WAR, centers of training in plastic surgery were established in Great Britain and the United States. After training with Gillies and Kilner in 1936 and 1937, and after further studies in reconstructive surgery in Paris, Munich, and Berlin, the author returned to Sweden and was the first to fully devote himself to this problem. This led to his consultative appointment in plastic surgery in the Serafimer and Karolinska Hospitals in 1940, and was followed 4 years later by the establishment of the first Special Department for Plastic Surgery at the Serafimer Hospital. In 1947 the Swedish Medical Association recognized Plastic Surgery as a specialty with qualifications stipulating 2 years of general surgical and 3 years of plastic surgery training. In 1950 an associate professorship was established at Karolinska Institute for the author.

Other plastic units followed shortly and included a 26 bed unit at St. Goran's Hospital in Stockholm under Grenabo. In 1952 Hogeman started working at the Malmo General Hospital, which opened a 25 bed unit in 1954 and conferred on him an Associate Professorship at the new Malmo Hospital in this specialty. T. Skoog heads a unit of 26 beds at the University Hospital of Uppsala since 1951, and U. Engstrom has been attached as a consultant to the Sahlgrenska Hospital since 1953. Lastly, an 18 bed unit for the reconstruction of burns was founded in 1953 at the Karolinska Hospital in Stockholm. A definite teaching program is carried out at the Serafimer Hospital, which has enabled trainees from Denmark, Norway, Belgium, Italy, Austria, and Turkey to specialize in reconstructive surgery in their lands.

A survey of various plastic surgical conditions is then given as a guide for the specialists who, while in Sweden, wish to study any particular branch of reconstructive surgery.

Harelip. In the past, the primary treatment of harelip consisted of atraumatic repair of the lip with a V-Y procedure for closing the palate and Wardill's pharyngoplasty as needed. At present, Brown's method and LeMesurier's technique are favored. This treatment, for the most part, is done in children's hospitals, under endotracheal anesthesia.

Secondary harelip deformities are dealt with in close co-operation with orthodontic and dental specialists, in addition to speech and ear, nose, and throat specialists. Early operations to enlarge the upper lip are encouraged in order to permit free growth of the facial bones. Lifting up of the alar base by muscle flaps is often done in moderate cases instead of bone or cartilage grafting. Secondary palatal cases are of the "push back" type and are subjected to the V-Y method, and, recently, velopharyngoplasty has been performed.

Jaw deformities. Bilateral osteotomy for mandibular protrusion was first introduced in Sweden by Aleman in 1921, and has since been used also in disorders of bite due to recession and lateral displacement. Hogeman reviewed this subject very thoroughly, and described the "auriculotemporal syndrome" (taste-stimulated sweating and flushing of the temple and cheek). "Dish-face" deformity is repaired by a transverse ridge of bone chips across the front of the maxilla and bringing forward the bridge of the nose by an angulated block bone graft. Bone grafts from the iliac bones or ribs are used extensively for skeletal defects, and medullary bone is used for restoration of the contour and osteogenesis. In reconstruction of the nasal bridge when the transplant has a supportive function. bone has superseded cartilage.

In reconstruction of a defective external ear, the method of Gillies is favored. For repairing deformed ears, McEvitt's technique is favored; the cartilage is divided along the antihelix. In shell ear, the author's method is used.

For facial nerve palsy, static suspension was accomplished, first with fascia lata and later with wire. At present, Grundt's procedure which transmits a dynamic effect to the lip via the temporal muscle is favored.

Hemangiomas. Port wine stains are irradicated in the first year of life. Larger capillary angiomas in children and adults are excised and grafted. Telangiectatic and stellate angiomas are treated by diathermy. Arteriole and racemose venous angiomas may be removed in three stages: sclerosing, excision, and simultaneous or subsequent plastic repair.

Cavernous angiomas are treated with radium; lymphangiomas by excision and grafting. Chronic lymphedema has been treated with pedicled flaps to provide drainage, while more severe forms require radical excision and closure with free skin grafts.

In hypospadias, Johansson has popularized the Denis Browne buried-strip procedure, and uses a modification of this procedure for reconstruction of the male urethra in strictures. For the "meatus syndrome" he excises the posterior lip of the meatus and repairs the defect with a vaginal mucosal flap.

Burn shock is treated by the general surgeons—the local repair is the task of plastic surgery. Primary treatment consists either of pressure dressings of vaseline gauze or tight wet dressings. In indicated cases, Wallace's exposure treatment is being used. Free grafts are used for cover in most cases, but pedicled grafts are used when they are needed for restoration of the contour and for covering tendons and joints. Thin grafts are applied with paraffin gauze; thick grafts are sutured in place at normal skin tension. Skin grafts from donors are used when there is a shortage of skin. The Burns Unit at Stockholm has a skin bank, and at Uppsala Skoog has demonstrated that free skin grafts can remain viable after a year at minus 70 degrees C.

Hand surgery is being developed in Sweden by the plastic surgeons and a small group of general sur-

geons. Skoog wrote a valuable contribution to the treatment of Dupuytren's contracture.

In the correction of mammary hypertrophy, a two pedicle procedure with excision of a wedge-shaped segment from the upper medial quadrant is favored. Very little nipple necrosis ensues with this technique. Free transplantation of the nipple is reserved for those cases in which pregnancy need not be considered, in which previous pregnancy has not induced lactation, and in which the breasts are of gigantic size.

For mammary hypoplasia, free derma-fat grafts are introduced through a curved incision at the submammary fold. The graft is taken from the subgluteal fold. The epidermis and outer corium are removed with a dermatome or Blair knife and the graft is removed in one piece down to the muscle. This has given good results and shows a lesser tendency toward reabsorption than the use of fat alone or fat combined with fascia. —*Carl Schiller, M.D.*

Skin Sloughs in Patients with Meningococcemia. N. Georgiade, C. Maguire, H. Crawford, and K. Pickrell. *Plastic & Reconstr. Surg.*, 1955, 15: 478.

The authors report their experience with 2 patients with scattered necrotic areas resulting from meningococcal gangrene. The best treatment was believed to be excision of the necrotic areas and grafting as soon as practical.

Acute fulminating meningococcal septicemia (Waterhouse-Friderichsen syndrome) is characterized by the presence of extensive ecchymotic, petechial, and purpuric areas scattered over the body. The usual course for this rare complication is death, attributed to bilateral massive hemorrhages in the adrenal glands. More recent re-evaluation of the purpuric lesions in meningococcemia show the close relationship of the purpuric spots to the Schwartzman phenomenon which involves the local skin reactivity which can be induced by skin injections of filtrate from the organisms. This is followed in 24 hours by intravenous injections of the same filtrate. The procedure will then produce severe hemorrhages at the sites of the previous skin injection a few hours later.

The characteristic initial picture of meningococcal gangrene is one of scattered erythematous areas which gradually become more cyanotic in appearance and eventually form blebs which drain a serosanguineous fluid. In a few days the entire area becomes dark blue in color and is sharply demarcated from the surrounding skin. These necrotic areas are usually scattered, particularly over the lower extremities; however, any portion of the body can be involved.

The authors believe that the necrosis of scattered cutaneous areas is best treated by excision and early skin grafting which shortens the period of convalescence considerably. —*F. W. Pirruccello, M.D.*

Tumors and Cutaneous Lesions of Benign Character and of Spinocellular Structure (Tumores y lesiones cutaneas de caracter benigno y estructura espinocelular). N. Puente Duany. *Arch. cuban. cancer.*, 1955, 14:1.

For some years the author has been writing about tumors of the skin and other cutaneous lesions (Surg. Gyn. Obst.; Internat. Abstr. Surg., 1951, 93: 102; 1952, 94: 328; 1954, 99: 141). Last year (*Arch. cuban. cancer.*, 1954, Oct.-Dec.) he described multiple cutaneous tumors of benign character and spinocellular structure and included solitary lesions of the same clinical and histological appearance. In that article 2 instances of multiple lesions were reported in complete detail; however, since that publication further study has uncovered the astonishing similarity between the multiple and the solitary lesions. Thus, he now groups both varieties of cutaneous lesions under the same title, considering the multiple lesions as merely a variety of the solitary lesion.

He again briefly describes the 2 cases of multiple lesions, and as the result of his studies gives the following general conclusions with regard to both varieties:

There is a group of infections which may produce epithelial changes closely resembling well differentiated epidermoid epitheliomas. These infections may be both banal and specific (tuberculosis, syphilis, fungi).

These pseudoepitheliomatous proliferations may be distinguished from true epidermoid tumors by the absence of deep infiltrations; they generally do not extend farther than the level of the sweat glands; they do not metastasize. There is no evidence of the anaplastic changes which characterize the true epithelial tumors. These changes present the histologic appearance of grade I epitheliomas of Broder's classification. When the histologic picture assumes that of the grade II or III tumors, the microscopic diagnosis may be impossible. The diagnosis may be facilitated, however, by the concomitant findings (giant cells in tuberculosis; vascular alterations in syphilis; microabscesses and fungi in the mycoses). In traumatic pseudoepitheliomatous changes the lesions are usually situated on the extremities.

There are, in addition, a variety of pseudoepitheliomatous lesions of the skin which present clinical and evolutionary findings which differ from those here described. These are the keratoma-acanthomas and keratomas of the British dermatologists; these will be the subject of a subsequent communication.

—*John W. Brennan, M.D.*